

Ruriko Yoshida

Markov degree of the three-state toric homogeneous Markov chain model

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Joint work with A. Tamekura, D. Haws, and A. Martín del Campo

`polytopes.net`

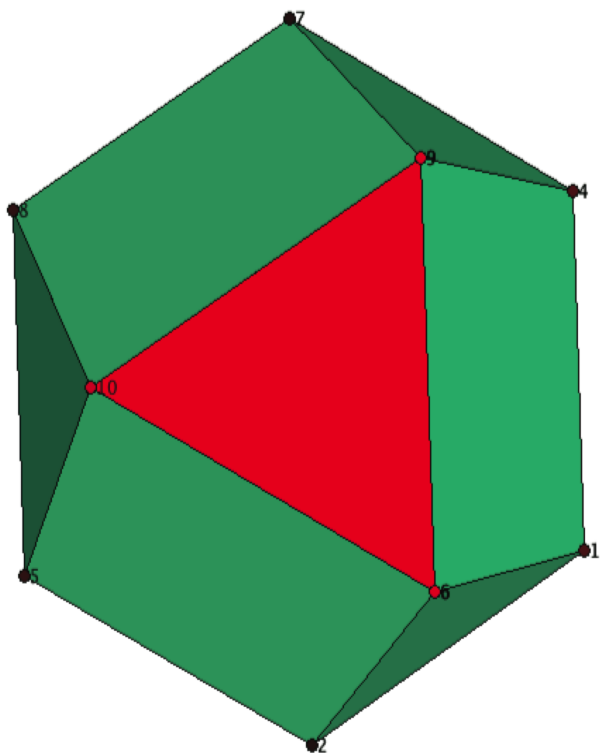
Polytopes

Polytope is a convex hull of a set of finite points in \mathbb{R}^d .

There are some polytopes that useful to study some problems in Algebraic Statistics.

For example:

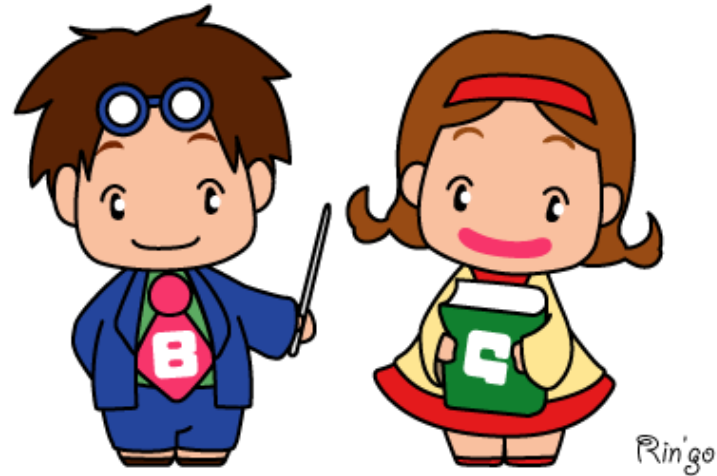
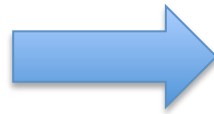
1. Balanced Minimum Evolution (BME) polytopes.
2. Polytopes to study toric homogenous Markov chain model.
3. In Jing's talk: Characteristic imset polytope.



Since I love polytopes

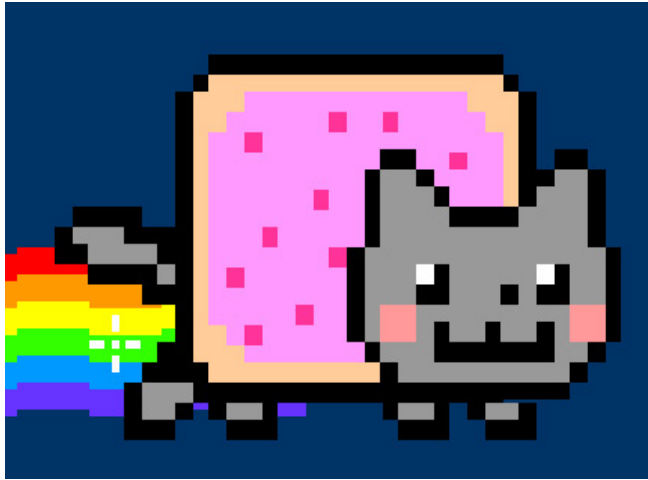
- Maybe I need a logo on polytopes like prof Hibi's group in Osaka?
- Since I love cats and polytopes.....

Hibi's logo



Like prof Hibi, I need a logo.....

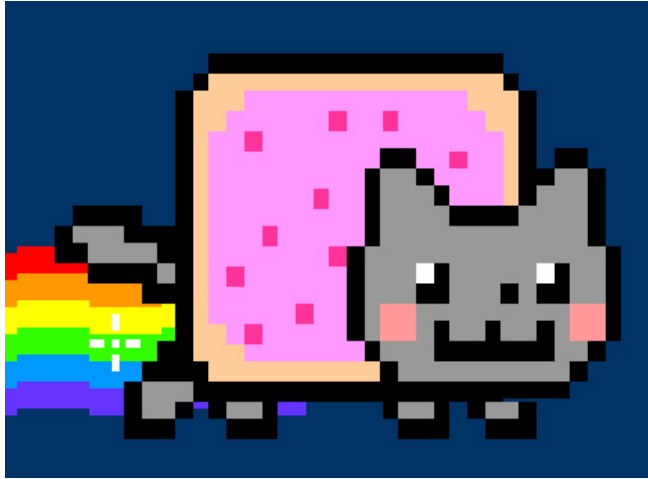
Like prof Hibi, I need a logo.....



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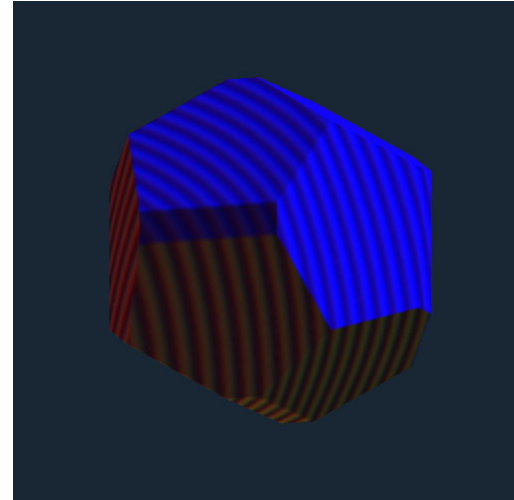
Popturt cat

Like prof Hibi, I need a logo.....



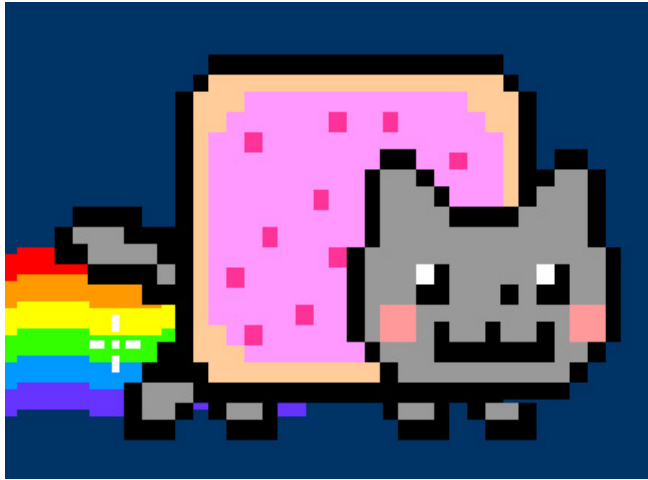
Popturt cat

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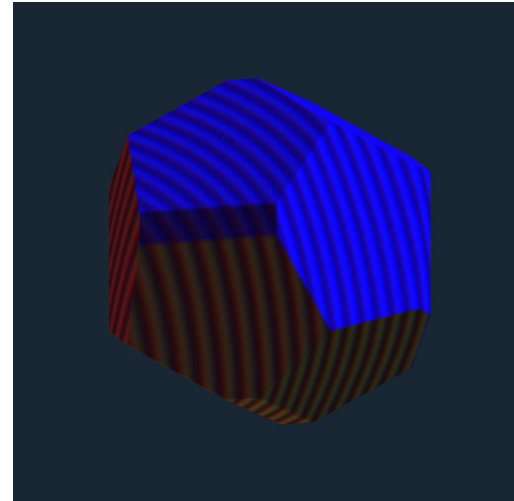
polytope

Like prof Hibi, I need a logo.....



Popturt cat

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polytope

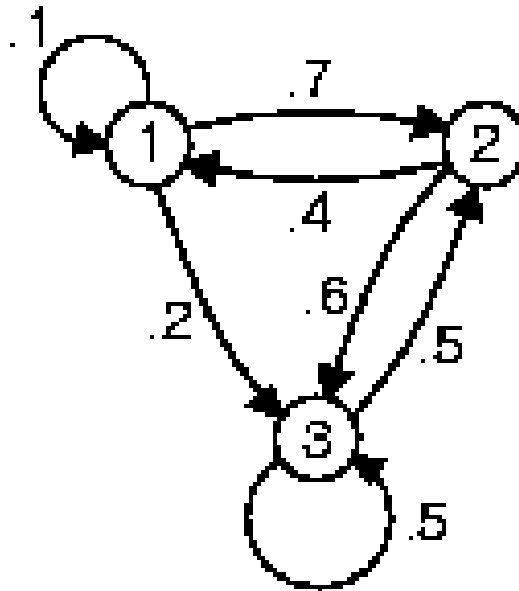
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Polytope cat

Discrete time Markov chain

We consider a discrete time Markov chain X_t , with $t = 1, \dots, T$ ($T \geq 3$), over a finite space of states $[S] = \{1, \dots, S\}$.



Toric homogeneous Markov chain

Let $\mathbf{w} = (s_1, \dots, s_T)$ be a path of length T on states $[S]$, which is sometimes written as $\omega = (s_1 \cdots s_T)$ or simply $\omega = s_1 \cdots s_T$. We are interested in Markov bases of toric ideals arising from the following statistical models

$$p(\omega) = \gamma_{s_1} \beta_{s_1, s_2} \cdots \beta_{s_{T-1}, s_T}. \quad (1)$$

where γ_{s_i} indicates the probability of the initial state, and β_{s_i, s_j} are the transition probabilities from state s_i to s_j . The model (1) is called a toric homogeneous Markov chain (THMC) model.

Problem We want to understand a **Markov basis** under THMC model as $T \rightarrow \infty$.

Four models

We refer to them as Model (a), Model (b), Model (c), and Model (d), according to the following:

- (a) THMC model (1)
- (b) THMC model without initial parameters.
- (c) THMC model without self-loops: $\beta_{s_i, s_j} = 0$ whenever $s_i = s_j$.
- (d) THMC model without initial parameters and without self-loops, i.e., both (b) and (c) are satisfied

Design matrix for Model (a)

Ordering $[S] \cup [S]^2$ and $[S]^T$ lexicographically, the matrix $A^{(a)}$ is:

	1111	1112	1121	1122	1211	1212	1221	1222	2111	2112	2121	2122	2211	2212	2221	2222
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
11	3	2	1	1	1	0	0	0	2	1	0	0	1	0	0	0
12	0	1	1	1	1	2	1	1	0	1	1	1	0	1	0	0
21	0	0	1	0	1	1	1	0	1	1	2	1	1	1	1	0
22	0	0	0	1	0	0	1	2	0	0	0	1	1	1	2	3

Design matrix for Model (b)

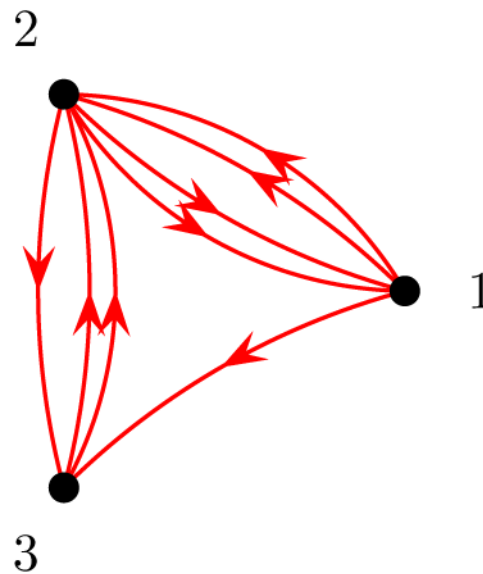
Ordering $[S]^2$ and $[S]^T$ lexicographically with $S = 2$ and $T = 4$ the matrix $A^{(b)}$ is:

	111	112	121	122	211	212	221	222	211	212	221	222	211	221	222	222
11	3	2	1	1	1	0	0	0	2	1	0	0	1	0	0	0
12	0	1	1	1	1	2	1	1	0	1	1	1	0	1	0	0
21	0	0	1	0	1	1	1	0	1	1	2	1	1	1	1	0
22	0	0	0	1	0	0	1	2	0	0	0	1	1	1	2	3

Example for Model (d)

The state graph $G(W)$ of $W = \{(12132), (12321)\}$. Also the state graph $G(\overline{W})$ where $\overline{W} = \{(13212), (21232)\}$.

Test statistics for both sets of paths is $[2, 1, 2, 1, 0, 2]$.



Quiz

Consider Model (d). The state graph $G(W)$ of $W = \{(21323), (31321)\}$.
What is their test statistics?

Quiz

Consider Model (d). The state graph $G(W)$ of $W = \{(21323), (31321)\}$.
What is their test statistics?

Test statistics for the observed set of paths is $[0, 2, 2, 1, 1, 2]$.

Two-state THMC

Hara and Takemura (2010) provided a full description of the *Markov bases* for the THMC model (on Model (a) and Model (b)) in two states (i.e. when $S = 2$) that does not depend on T .

Inspired by their work, we study the algebraic and polyhedral properties of the Markov bases of the three-state THMC model for any time $T > 3$.

We hoped we could have the same result for the three-state THMC model without initial parameters and without self-loops (however not yet!).

Recall Markov basis

Suppose $P = \{x \in \mathbb{R}^d \mid Ax = b, x \geq 0\} \neq \emptyset$ and let M be a finite set such that $M \subset \{x \in \mathbb{Z}^d \mid Ax = 0\}$.

We define the graph G_b such that:

- Nodes of G_b are all the lattice points inside of P .
- We draw an undirected edge between a node u and a node v iff $u - v \in M$.

Definition :

M is called a **Markov basis** if G_b is a connected graph for all b .

Example

				Total
	? ? ?	? ? ?	? ? ?	6
	? ? ?	? ? ?	? ? ?	6
Total	4	4	4	

Table 1: 2×3 tables with 1-marginals.

There are 19 tables with these marginals.

$$\begin{array}{c} + \\ \hline \end{array} \begin{array}{|c|c|c|} \hline 1 & -1 & 0 \\ \hline -1 & 1 & 0 \\ \hline \end{array} \quad \begin{array}{c} + \\ \hline \end{array} \begin{array}{|c|c|c|} \hline 0 & 1 & -1 \\ \hline 0 & -1 & 1 \\ \hline \end{array}$$

$$\begin{array}{c} + \\ \hline \end{array} \begin{array}{|c|c|c|} \hline 1 & 0 & -1 \\ \hline -1 & 0 & 1 \\ \hline \end{array}$$

There are 3 elements in a Markov basis modulo signs.

$$\begin{array}{|c|c|c|} \hline 4 & 0 & 2 \\ \hline 0 & 4 & 2 \\ \hline \end{array} + \begin{array}{|c|c|c|} \hline -1 & 0 & 1 \\ \hline 1 & 0 & -1 \\ \hline \end{array} = \begin{array}{|c|c|c|} \hline 3 & 0 & 3 \\ \hline 1 & 4 & 1 \\ \hline \end{array}$$

A table with the marginals plus an element of a Markov basis is also a table with the given marginals.

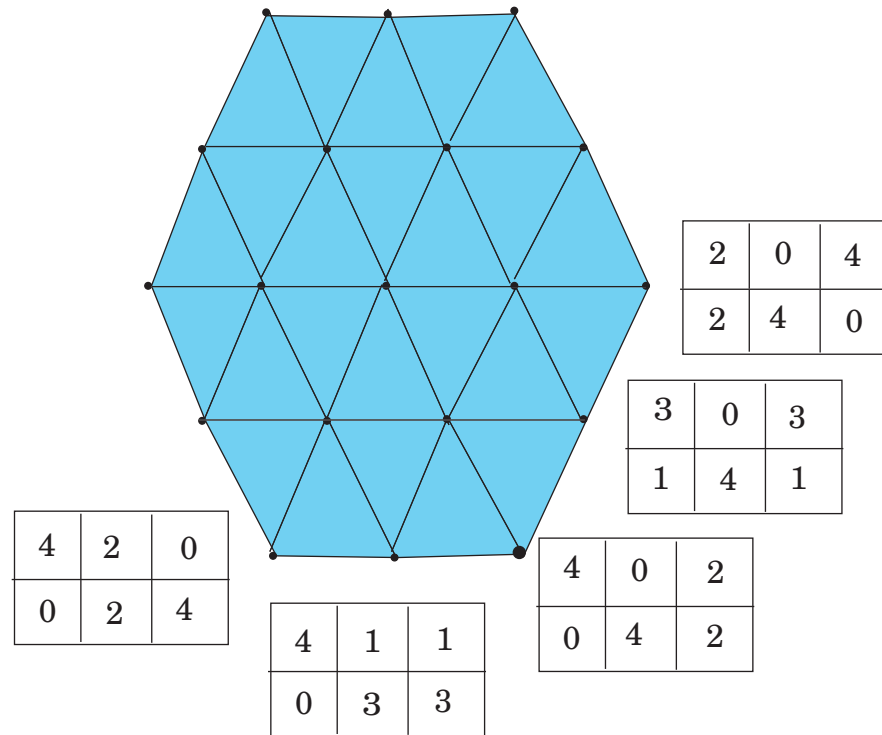


Figure 1: A Markov basis for 2×3 tables. An element of the Markov basis is a undirected edge between integral points in the polytope.

Good news

Theorem: For any $T \geq 4$, a minimum Markov basis for the toric ideal $I_{A^{(d)}}$, where $A^{(d)}$ is the design matrix under Model (d), consists of binomials of degree less than or equal to $d = 6$.

We used polyhedral geometry to prove this theorem.

Polyhedral geometry

Here we focus on Model (d) and $S = 3$.

Look closely at $P^{(d)}$, the convex hull generated by the columns of the design matrix for Model (d).

Recall: The *convex hull* of $\{\mathbf{a}_1, \dots, \mathbf{a}_m\} \subset \mathbb{R}^n$ is defined as

$$\text{conv}(\mathbf{a}_1, \dots, \mathbf{a}_m) := \left\{ \mathbf{x} \in \mathbb{R}^n \mid \mathbf{x} = \sum_{i=1}^m \lambda_i \mathbf{a}_i, \sum_{i=1}^m \lambda_i = 1, \lambda_i \geq 0 \right\}.$$

A *polytope* P is the convex hull of finitely many points.

For $k \in \mathbb{N}$, we define the k -th dilation of P as $kP := \{k\mathbf{x} \mid \mathbf{x} \in P, \}$. A point $\mathbf{x} \in P$ is a *vertex* if and only if it can not be written as a convex combination of points from $P \setminus \{\mathbf{x}\}$.

The *cone* of $\{\mathbf{a}_1, \dots, \mathbf{a}_m\} \subset \mathbb{R}^n$ is defined as

$$\text{cone}(\mathbf{a}_1, \dots, \mathbf{a}_m) := \left\{ \mathbf{x} \in \mathbb{R}^n \mid \mathbf{x} = \sum_{i=1}^m \lambda_i \mathbf{a}_i, \lambda_i \geq 0 \right\}.$$

Integer lattice $L := \mathbb{Z}A = \{n_1 a_1 + \dots + n_m a_m \mid n_i \in \mathbb{Z}\}$.

The semigroup $S := \mathbb{N}A := \{n_1 a_1 + \dots + n_m a_m \mid n_i \in \mathbb{N}\}$.

Let $P^{(d)}$ be the convex hull generated by the columns of the design matrix for Model (d), let $C^{(d)}$ be the cone generated by the columns of the design matrix for Model (d), let $L^{(d)}$ be the lattice generated by the columns of the design matrix for Model (d), and let $S^{(d)}$ be the semigroup generated by the columns of the design matrix for Model (d).

Prop: $kP^{(d)} = C^{(d)} \cap \{\sum_{i=1}^n x_i = k(T - 1)\}$ and $\bigcup_{k \geq 0} (kP^{(d)} \cap \mathbb{Z}^n) = C^{(d)} \cap L^{(d)}$.

Note: A semigroup is normal if and only if the semigroup is equal to the intersection between the cone and the lattice.

Theorem: We consider Model (d) and $S = 3$. The semigroup generated by the columns of the design matrix $A^{(d)}$ is normal for $T \geq 5$.

One notices that the set of columns of $A^{(d)}$ is a graded set.

Theorem 13.14 in [Sturmfels 1996] Let $A \subset \mathbb{Z}^d$ be a graded set such that the semigroup generated by the elements in A is normal. Then the toric ideal I_A associate with the set A is generated by homogeneous binomials of degree at most d .

Theorem: For any $T \geq 4$, a minimum Markov basis for the toric ideal $I_{A^{(d)}}$, where $A^{(d)}$ is the design matrix under Model (d), consists of binomials of degree less than or equal to $d = 6$.

Polyhedral geometry

Theorem Let $S = 3$. The number of vertices of $P^{(d)}$ is bounded by some constant C which does not depend on T .

Also we found their hyperplane representations.

Theorem For $T \geq 5$, the number of facets is 24 and we described explicitly the these 24 facet description of $P^{(d)}$ depend on $T \bmod 6$.

The number of Hilbert basis elements (`normaliz`) and f-vectors (`Polymake`) for Model (d) where $S = 3$. The running time of `normaliz` was under two seconds for all data sets.

T	#HB	f_0	f_1	f_2	f_3	f_4
4	20	20	69	90	51	12
5	30	27	114	167	102	24
6	48	24	111	176	111	24
7	66	41	144	189	108	24
8	96	42	171	230	123	24
9	123	45	186	245	126	24
10	166	56	201	252	129	24
11	207	63	216	257	126	24
12	264	54	189	236	123	24
13	320	77	246	279	132	24
14	396	54	189	236	123	24
15	468	63	216	257	126	24

Here we summarize all the inequalities in their original form and in their inhomogeneous form, that is using the equality $n(T - 1) = x_{12} + x_{13} + x_{21} + x_{23} + x_{31} + x_{32}$ where $n \geq 1$. Index are ordered by lexicographically. Permute on $[S]$.

For any $T \geq 5$, a row vector equivalent to

$$\mathbf{c} = [1, 0, 0, 0, 0, 0] \cdot x \geq 0$$

For any $T \geq 5$, a row vector equivalent to

$$\mathbf{c} = [T, T, -(T - 2), 1, -(T - 2), 1] \cdot x \geq 0$$

inhomogeneous

$$\mathbf{c} = [1, 1, -1, 0, -1, 0] \cdot x \geq -n.$$

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For any T odd, $T \geq 5$, a row vector equivalent to

$$\mathbf{c} = [1, 1, -1, -1, 1, 1] \cdot x \geq 0.$$

For any $T \geq 4$ of the form $T = 3k + 1$, $k \geq 1$, a row vector equivalent to

$$\mathbf{c} = [2, -1, -1, -1, 2, 2] \cdot x \geq 0.$$

For any $T \geq 5$ of the form $T = 3k + 2$, $k \geq 1$, a row vector equivalent to

$$\mathbf{c} = [2k + 1, -k, -k, -k, 2k + 1, 2k + 1] \cdot x \geq 0$$

inhomogeneous

$$(3 - n)(x_{12} + x_{31} + x_{32}) - n(x_{13} + x_{21} + x_{23}) \geq -n.$$

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For any $T \geq 6$, T :even, a row vector equivalent to

$$\left[\frac{3}{2}T - 1, \frac{T}{2}, -\frac{T}{2} + 1, -\frac{T}{2} + 1, -\frac{T}{2} + 1, \frac{T}{2}\right] \cdot x \geq 0$$

inhomogeneous

$$3x_{12} + x_{13} - x_{21} - x_{23} - x_{31} + x_{32} \geq -n.$$

For $T = 6k + 3$, a row vector equivalent to

$$[5k + 2, 2k + 1, -4k - 1, -k, -k, 2k + 1] \cdot x \geq 0$$

inhomogeneous

$$(6 - n)x_{12} + (3 - n)x_{13} - (3 + n)x_{21} + (3 - n)x_{32} - nx_{23} - nx_{31} \geq -2n.$$

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For $T = 6k$, a row vector equivalent to

$$[10k - 1, 4k, -8k + 2, -2k + 1, -2k + 1, 4k] \cdot x \geq 0$$

inhomogeneous

$$(6 - n)x_{12} + (3 - n)x_{13} - (3 + n)x_{21} + (3 - n)x_{32} - nx_{23} - nx_{31} \geq -2n.$$

Bad news

For Model (a),

Theorem The **semigroup** generated by the columns of the design matrix $A^{(a)}$ is not normal for $S \geq 3$ and $T \geq 4$.

For Model (b),

Theorem The semigroup generated by the columns of the design matrix $A^{(b)}$ is not normal for $S \geq 2$ and $T \geq 3$.

So it is very hard to understand a Markov basis for $T \rightarrow \infty$.

For Model (d),

The semigroup generated by the columns of the design matrix $A^{(d)}$ is not normal for $S = 4$ and $T \geq 5$.

Big conjecture

On the experimentations we ran, we found evidence that more should be true.

Conjecture Fix $S \geq 3$; then, for every $T \geq 4$, there is a Markov basis for the toric ideal $I_{A^{(d)}}$ consisting of binomials of degree at most $S - 1$, and there is a Gröbner basis with respect to some term ordering consisting of binomials of degree at most S .

Despite the computational limitations (the number of generators grows exponentially when T grows,) we were able to test this conjecture using the software 4ti2 for $T = 4, 5, 6$ with $S = 3$ and $T = 4, 5$ with $S = 4$.

Problem Provide a full description of the *Markov bases* for the THMC model (on Model (d)) in three states (i.e. when $S = 3$) that does not depend on T .

Question??

D Haws, A Martn del Campo, A Takemura, RY

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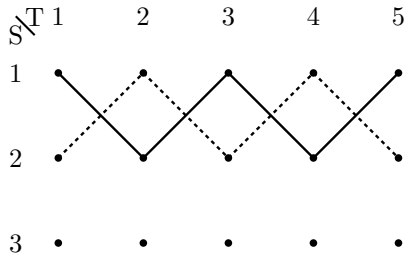
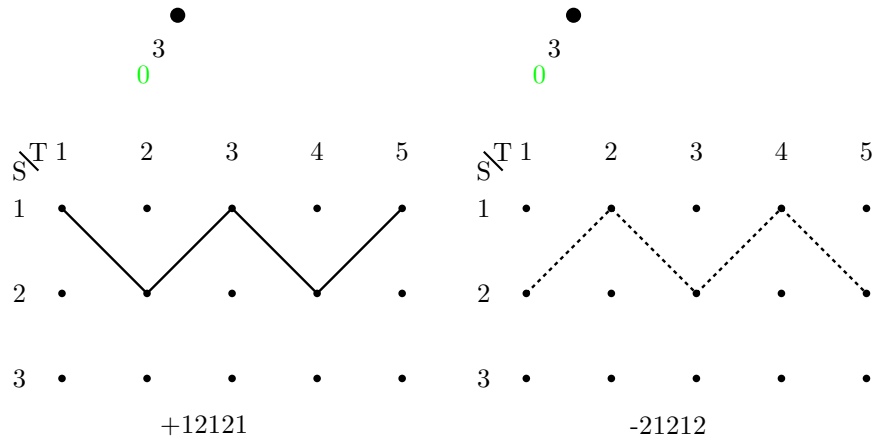
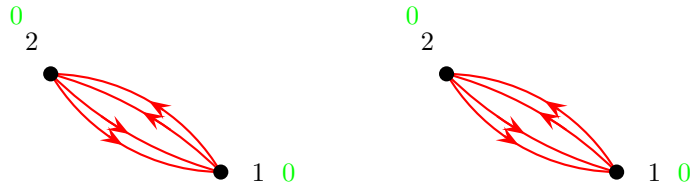
<http://arxiv.org/abs/1204.3070>

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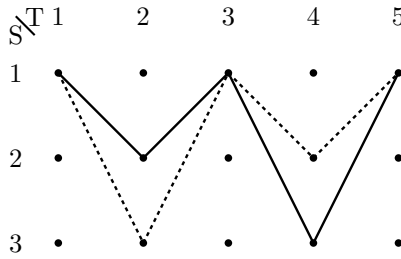
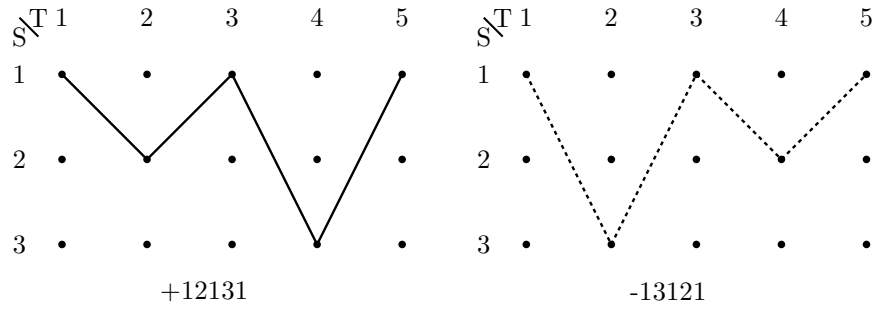
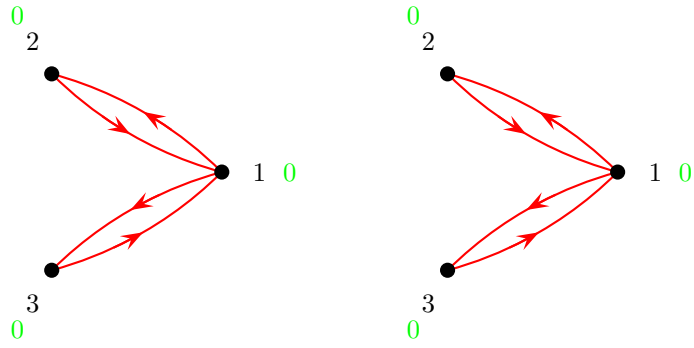
Thank you!

Orbit Size 1



Move Graph
 12121 21212
 $x_{1,2,1,2,1} - x_{2,1,2,1,2}$

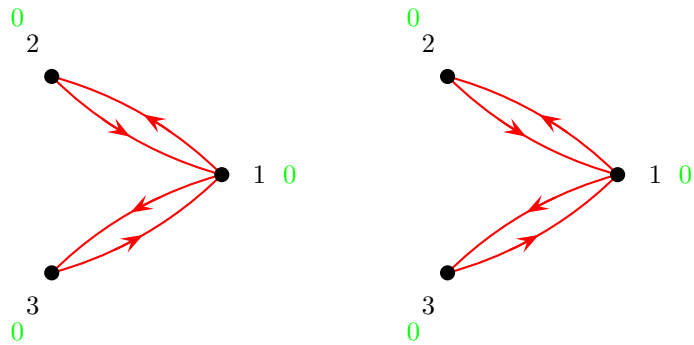
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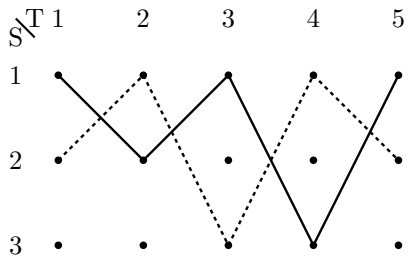
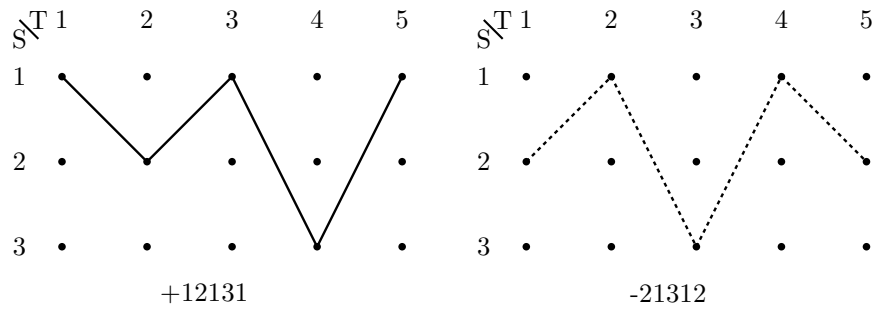


Move Graph

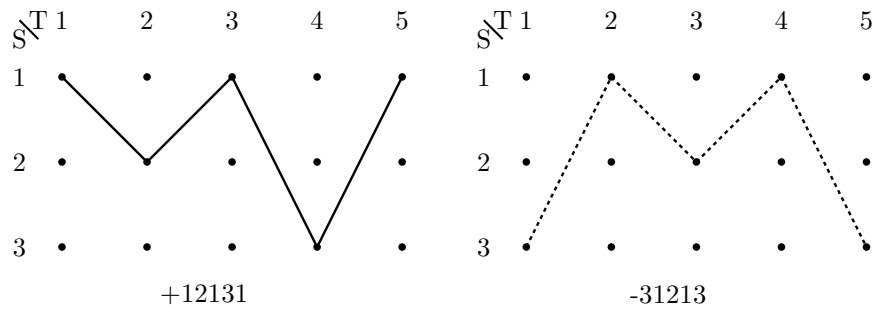
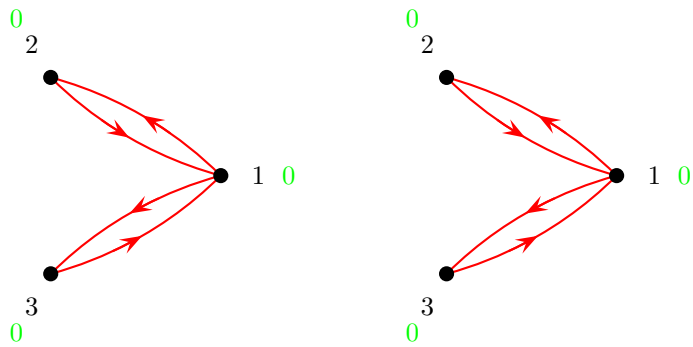
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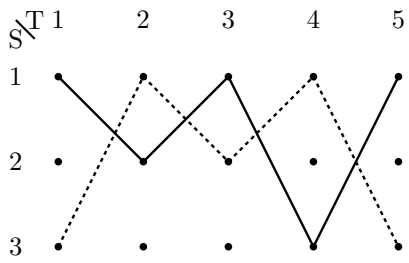
$$x_{1,2,1,3,1} - x_{1,3,1,2,1}$$





Move Graph
 12131 21312
 $x_{1,2,1,3,1} - x_{2,1,3,1,2}$



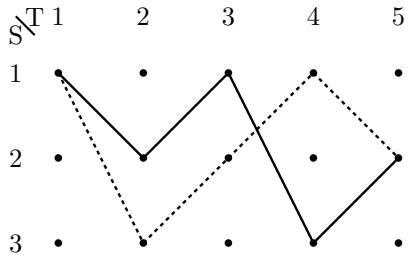
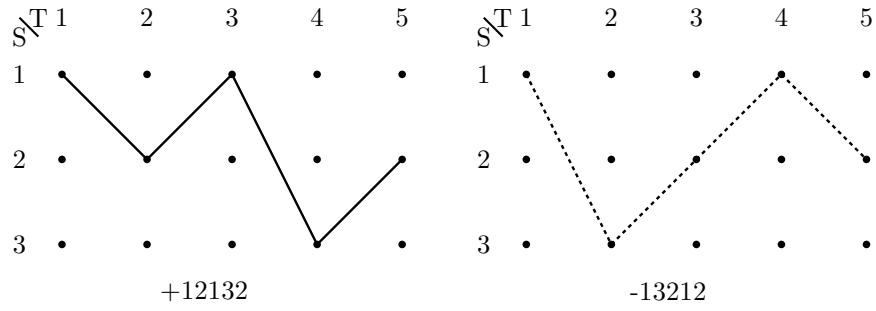
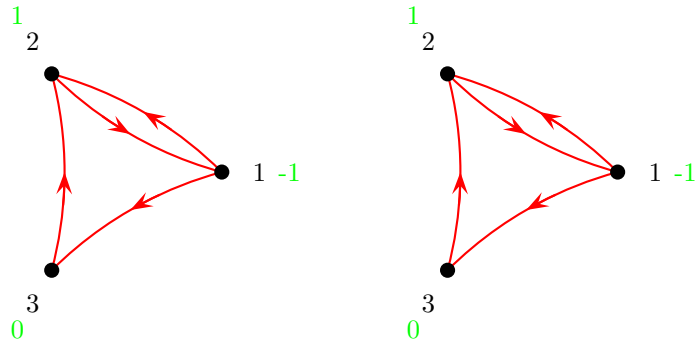


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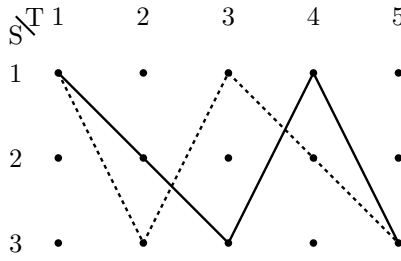
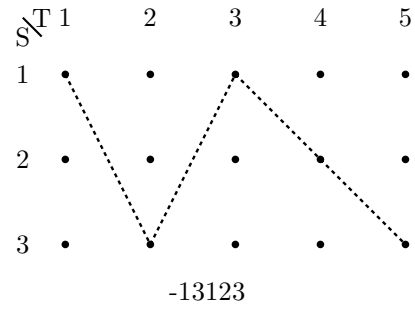
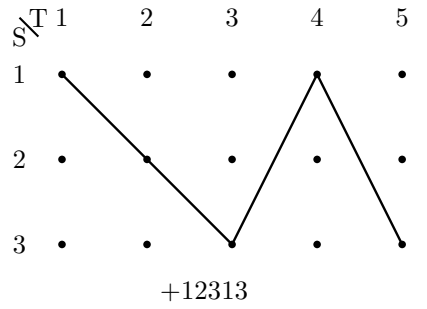
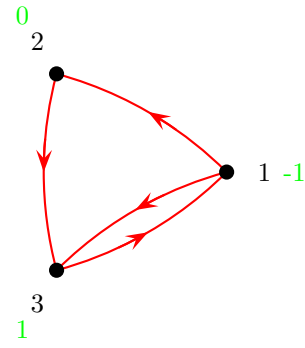
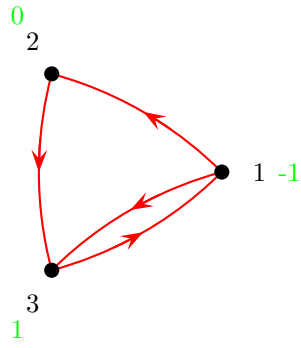
$x_{1,2,1,3,1} - x_{3,1,2,1,3}$

Orbit Size 1



Move Graph
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 $x_{1,2,1,3,2} - x_{1,3,2,1,2}$

Orbit Size 1

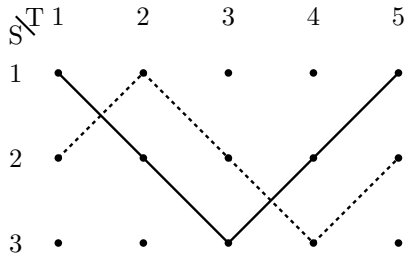
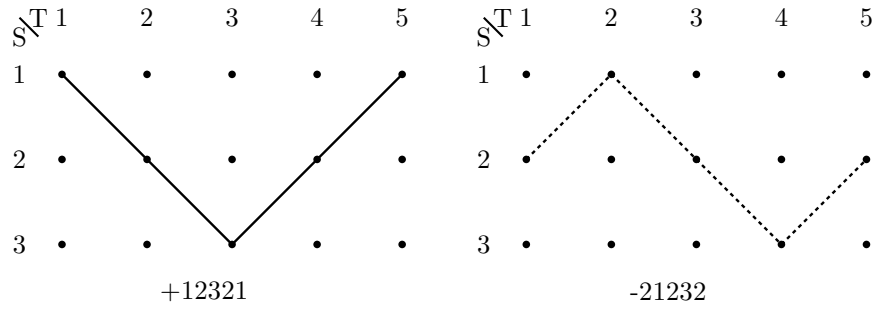
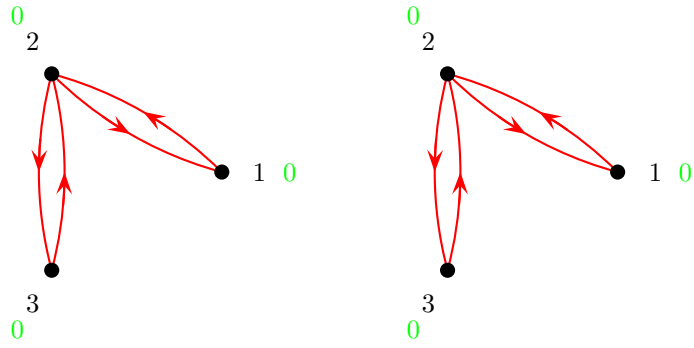


Move Graph

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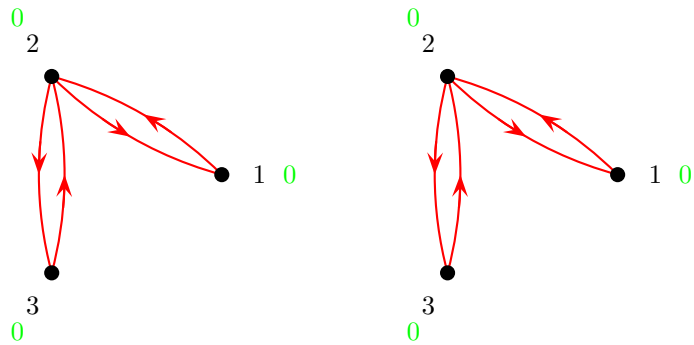
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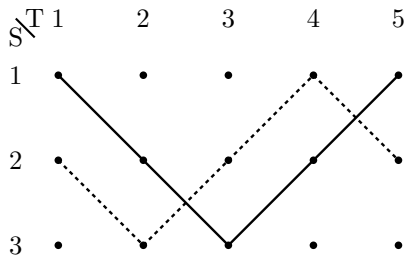
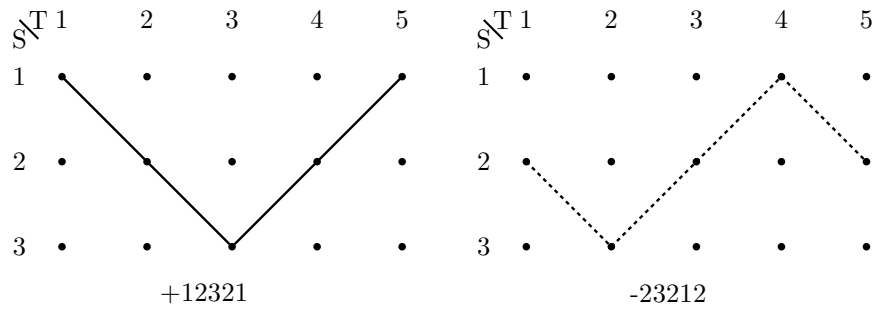


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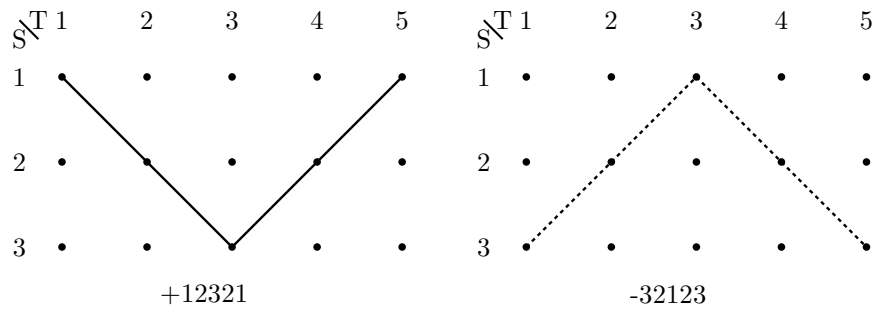
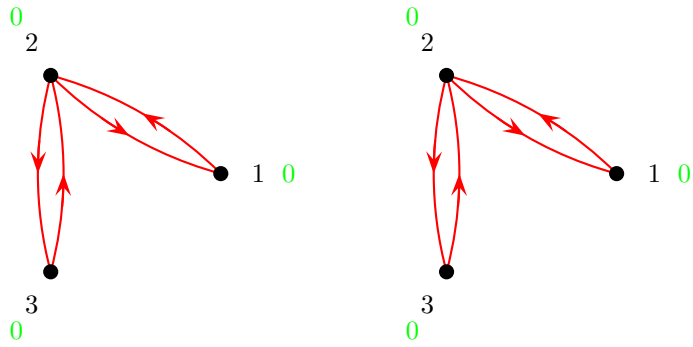
12321 21232

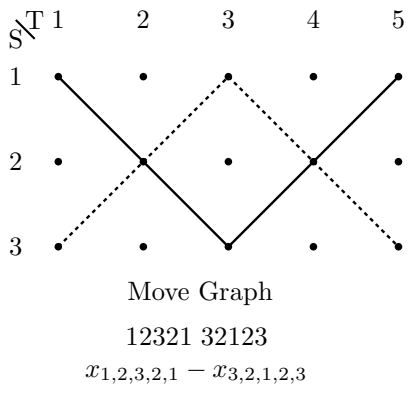
$x_{1,2,3,2,1} - x_{2,1,2,3,2}$



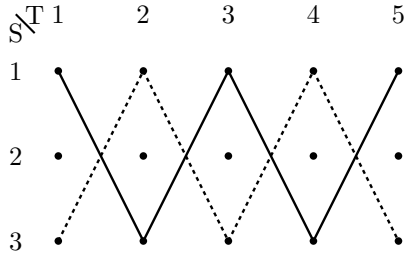
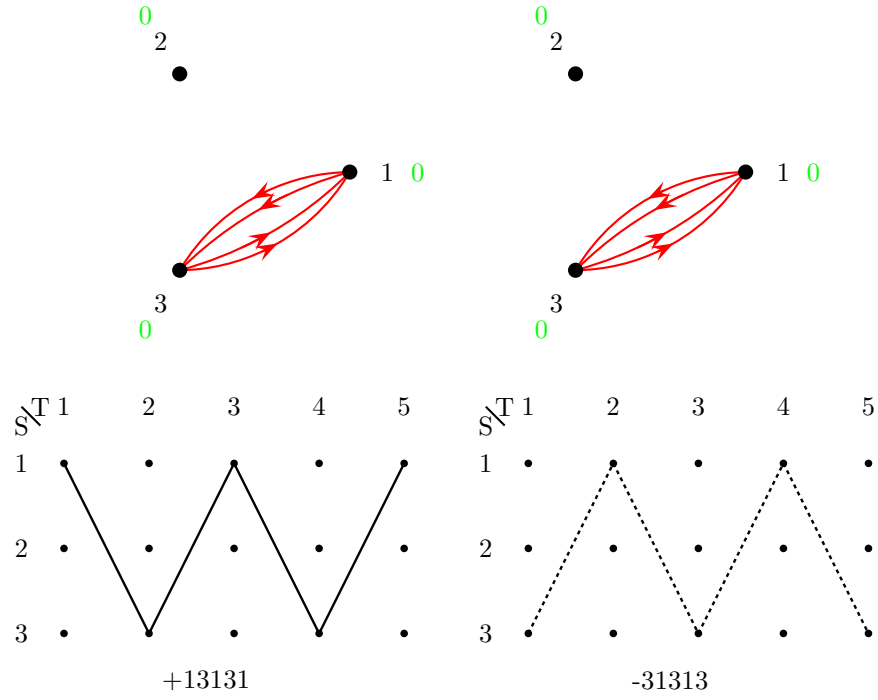


Move Graph
 12321 23212
 $x_{1,2,3,2,1} - x_{2,3,2,1,2}$





Orbit Size 1

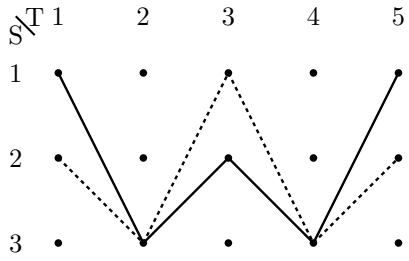
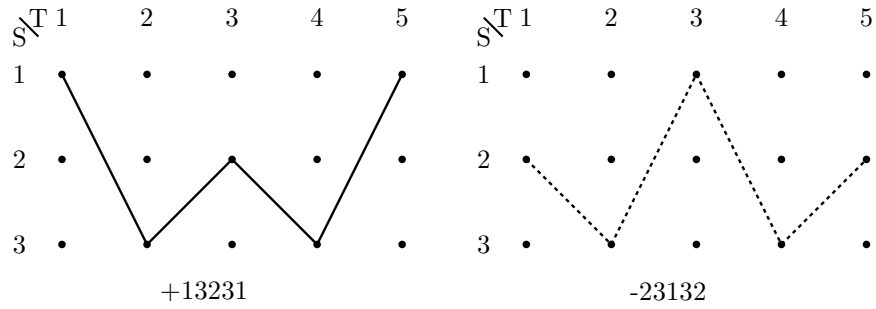
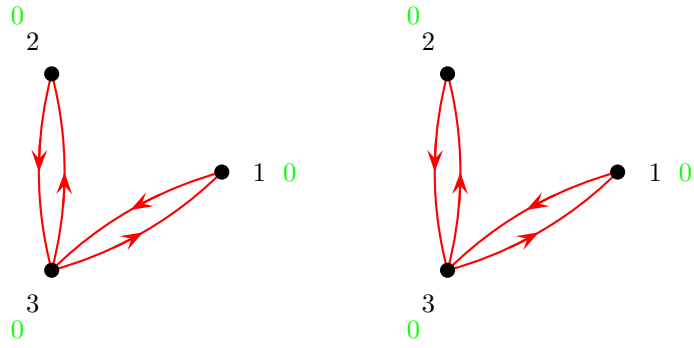


Move Graph

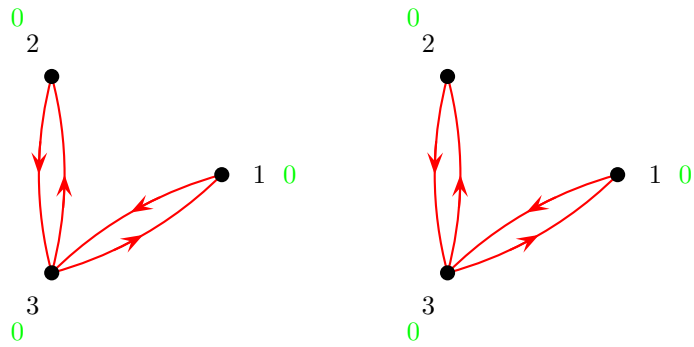
13131 31313

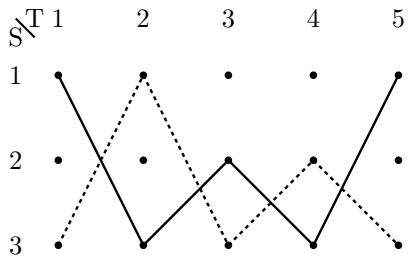
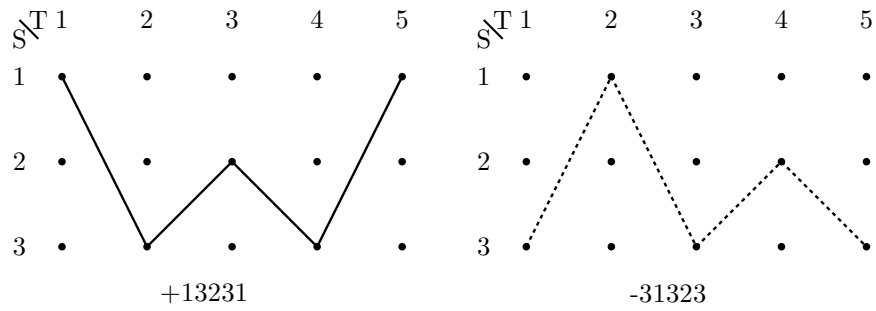
$x_{1,3,1,3,1} - x_{3,1,3,1,3}$

Orbit Size 1

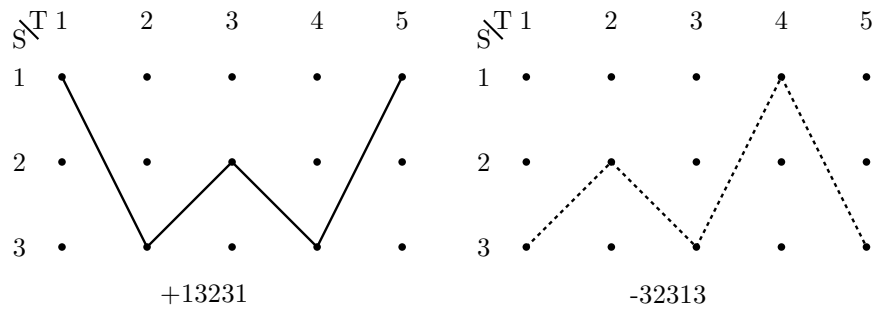
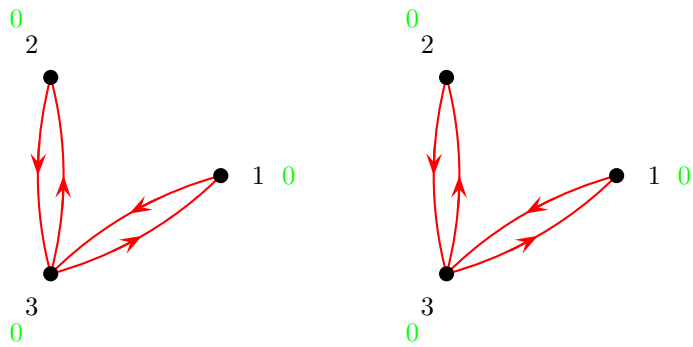


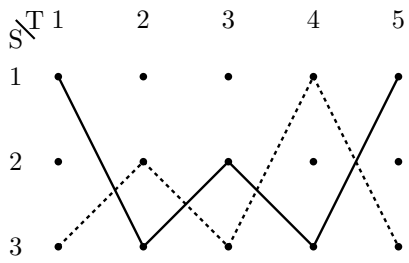
Move Graph
 13231 23132
 $x_{1,3,2,3,1} - x_{2,3,1,3,2}$





Move Graph
 13231 31323
 $x_{1,3,2,3,1} - x_{3,1,3,2,3}$



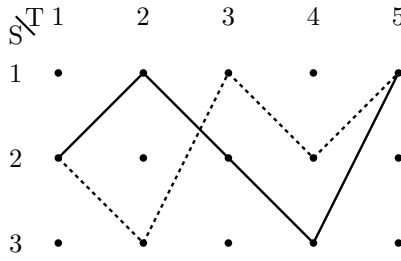
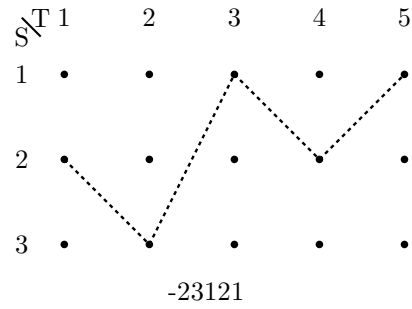
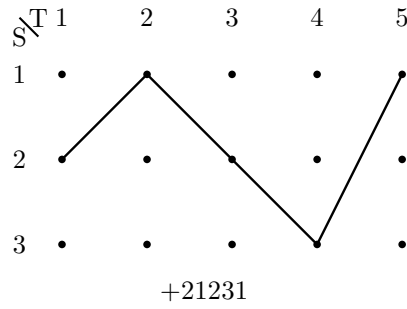
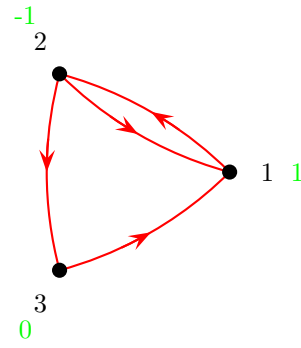
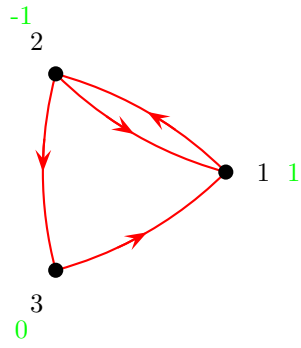


Move Graph

13231 32313

$x_{1,3,2,3,1} - x_{3,2,3,1,3}$

Orbit Size 1

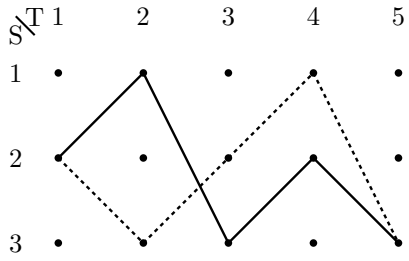
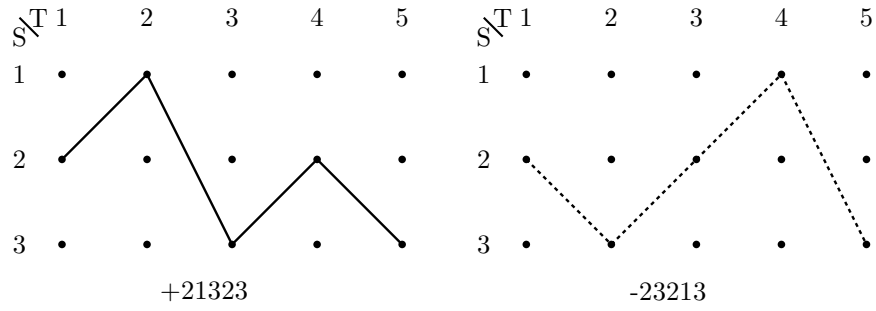
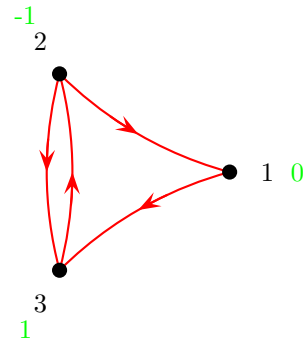
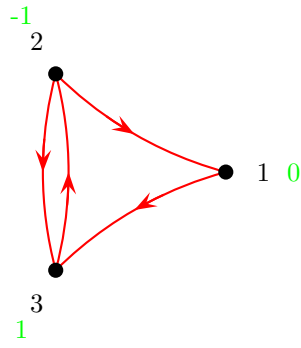


Move Graph

21231 23121

$x_{2,1,2,3,1} - x_{2,3,1,2,1}$

Orbit Size 1

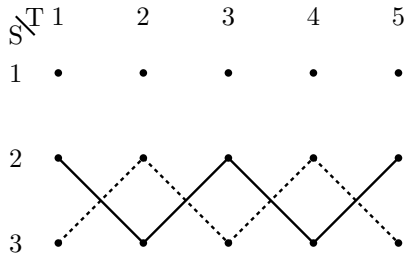
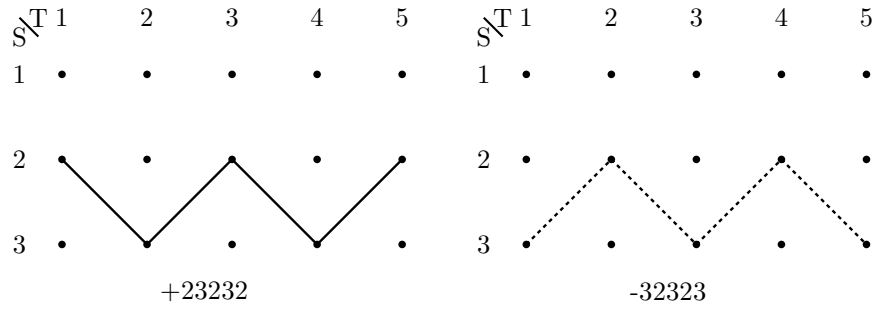
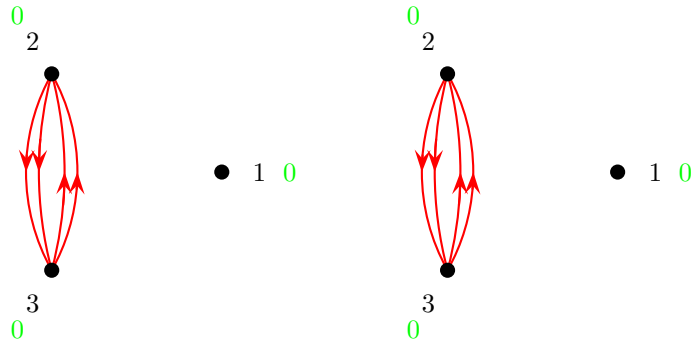


Move Graph

21323 23213

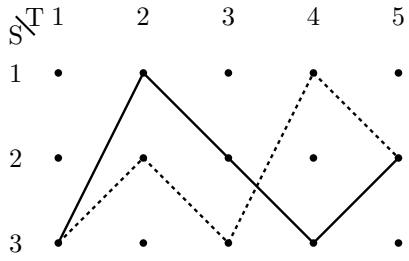
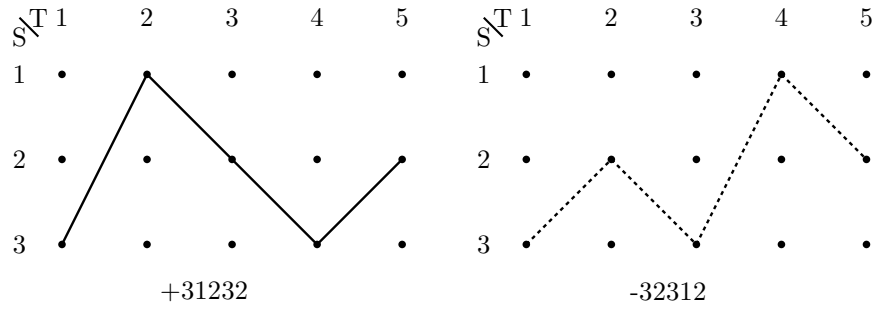
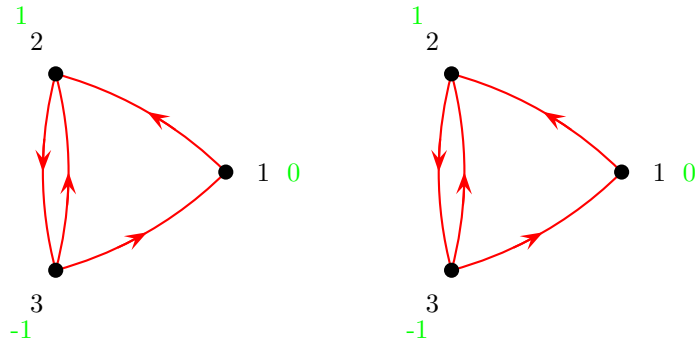
$x_{2,1,3,2,3} - x_{2,3,2,1,3}$

Orbit Size 1



Move Graph
 23232 32323
 $x_{2,3,2,3,2} - x_{3,2,3,2,3}$

Orbit Size 1

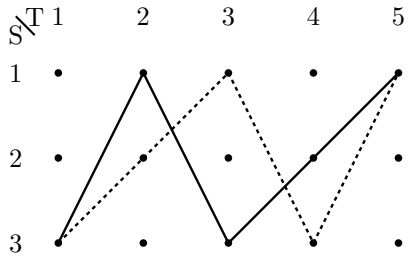
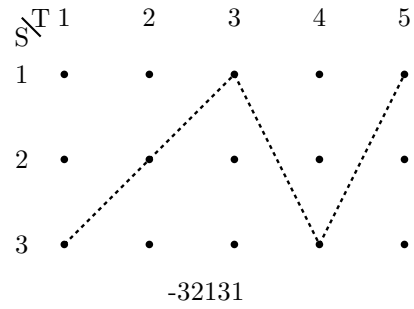
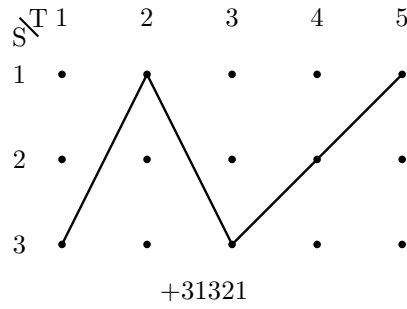
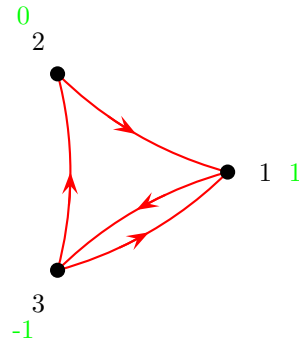
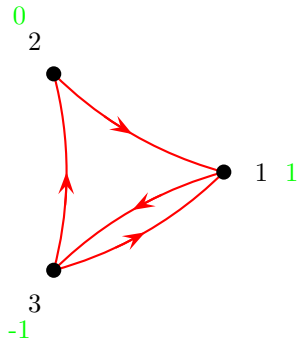


Move Graph

31232 32312

$x_{3,1,2,3,2} - x_{3,2,3,1,2}$

Orbit Size 1

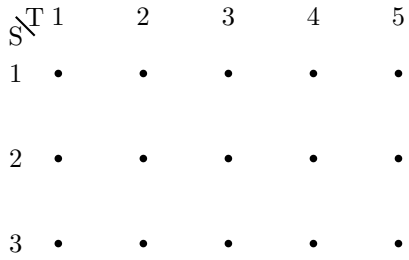
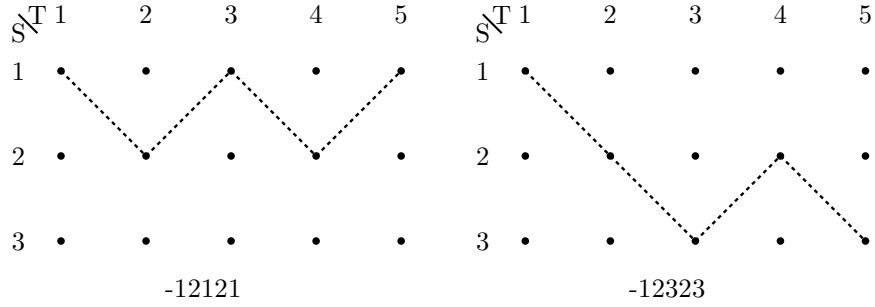
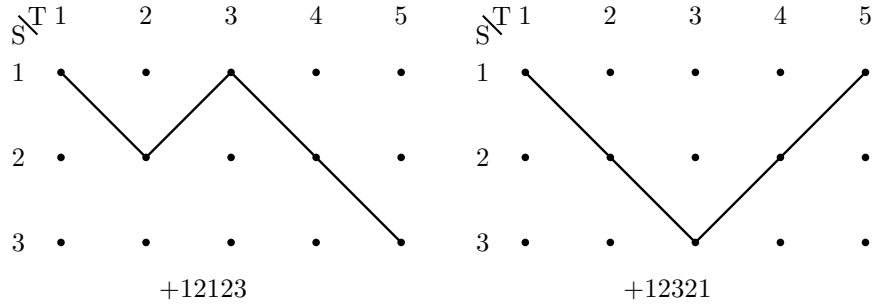
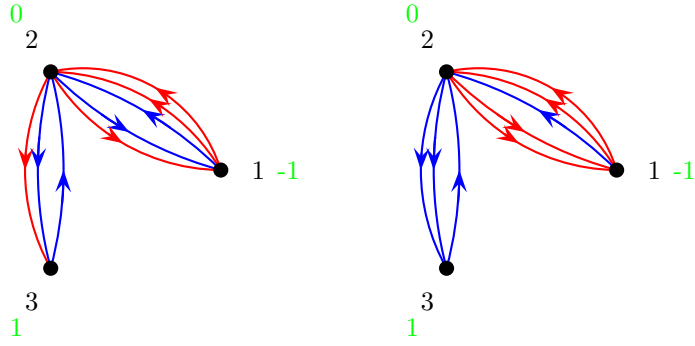


Move Graph

31321 32131

$x_{3,1,3,2,1} - x_{3,2,1,3,1}$

Orbit Size 2

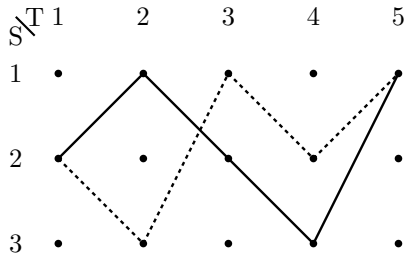
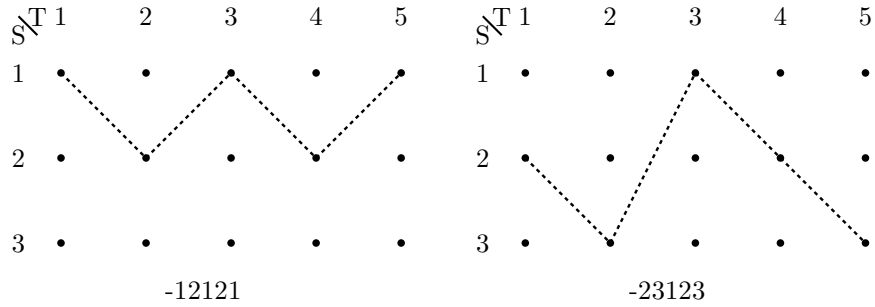
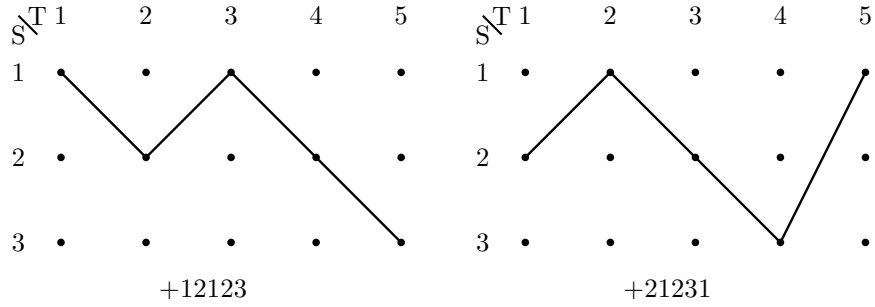
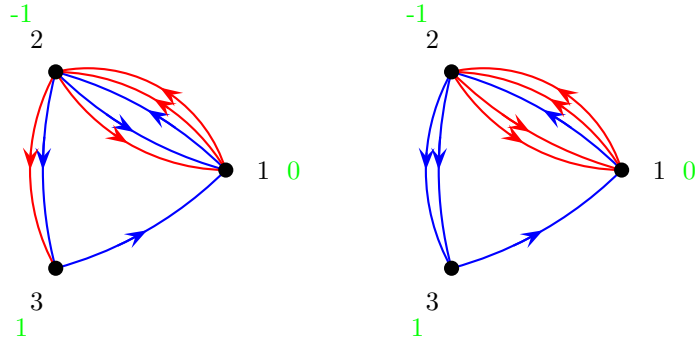


Move Graph

$$12123 \ 12321 \ 12121 \ 12323$$

$$-x_{1,2,1,2,3} * x_{1,2,3,2,1} + x_{1,2,1,2,1} * x_{1,2,3,2,3}$$

Orbit Size 2

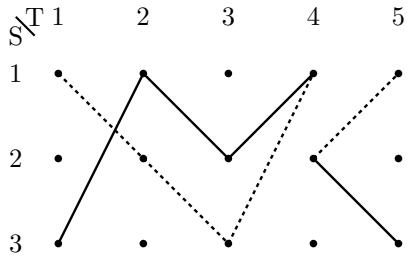
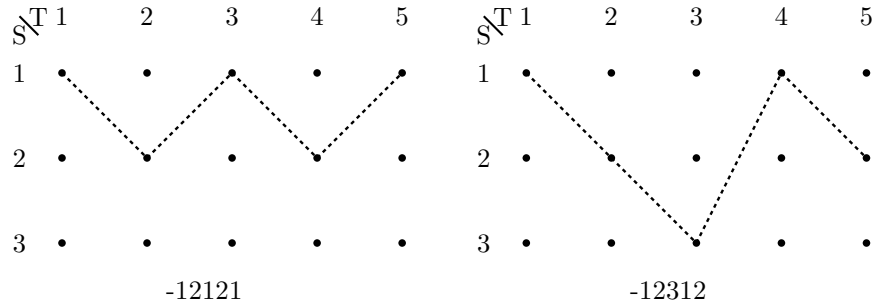
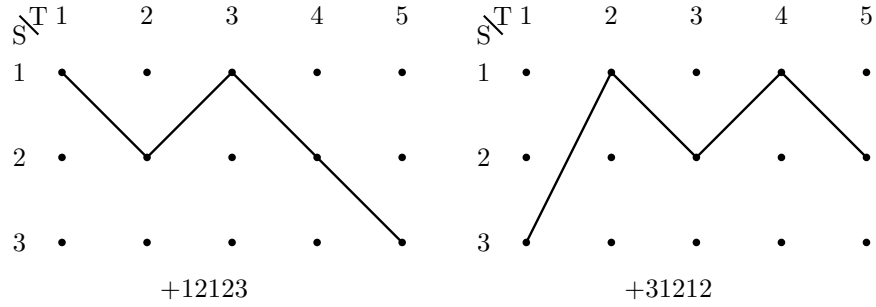
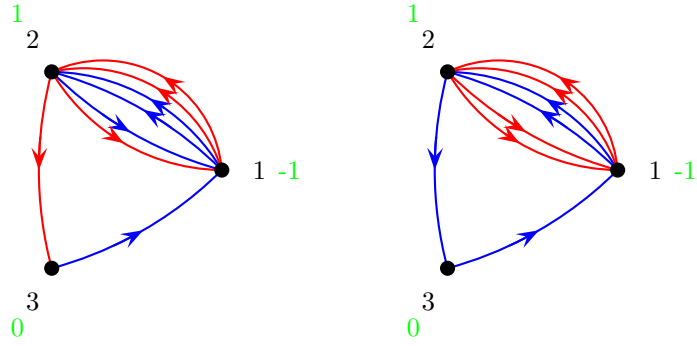


Move Graph

$$12123 \ 21231 \ 12121 \ 23123$$

$$-x_{1,2,1,2,3} * x_{2,1,2,3,1} + x_{1,2,1,2,1} * x_{2,3,1,2,3}$$

Orbit Size 2

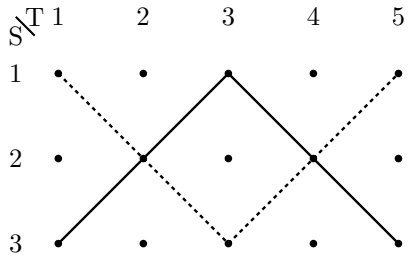
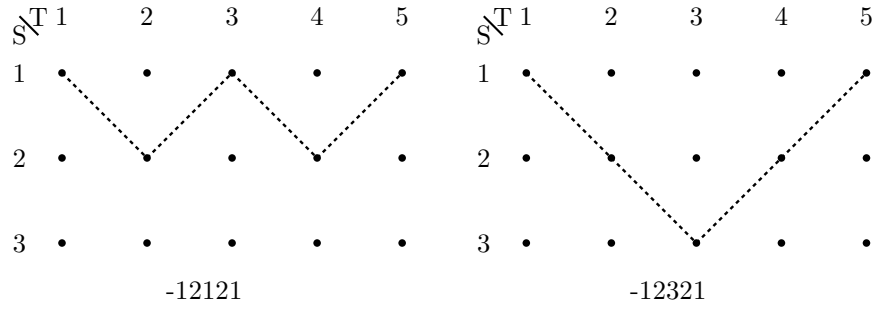
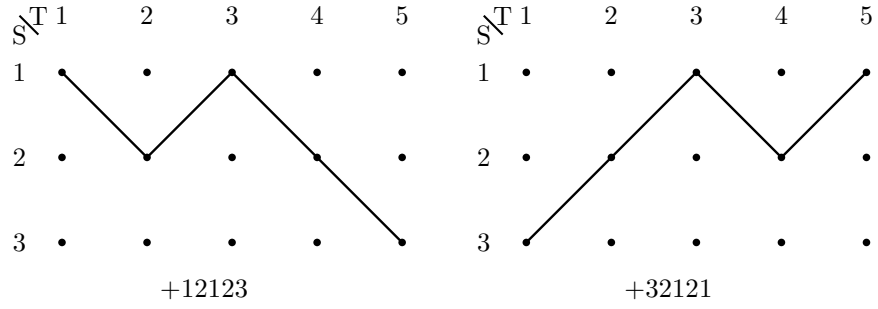
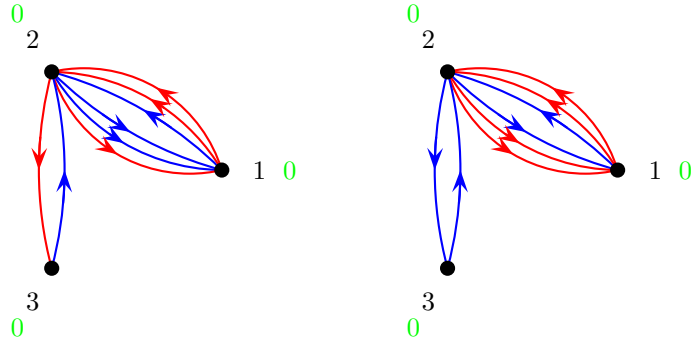


Move Graph

$$12123 \ 31212 \ 12121 \ 12312$$

$$-x_{1,2,1,2,3} * x_{3,1,2,1,2} + x_{1,2,1,2,1} * x_{1,2,3,1,2}$$

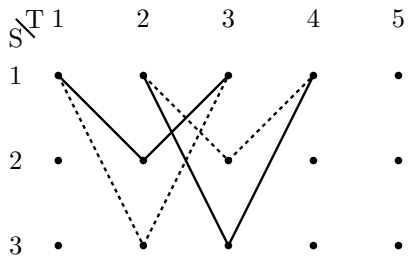
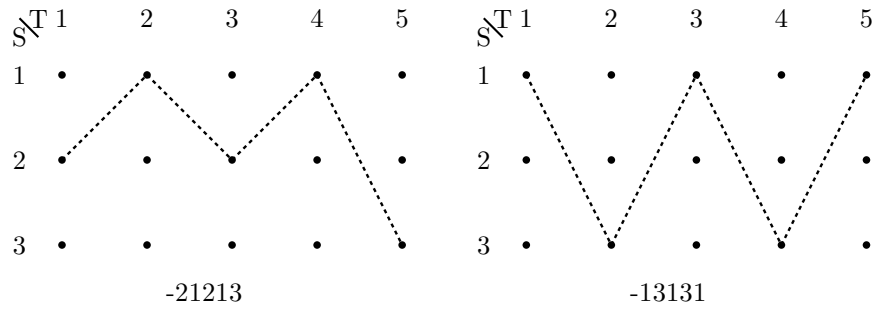
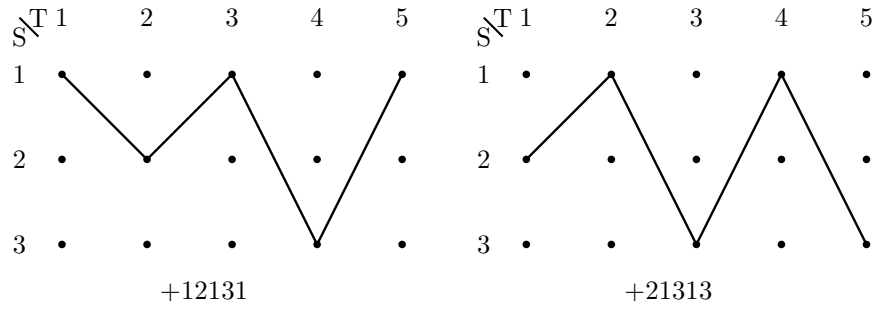
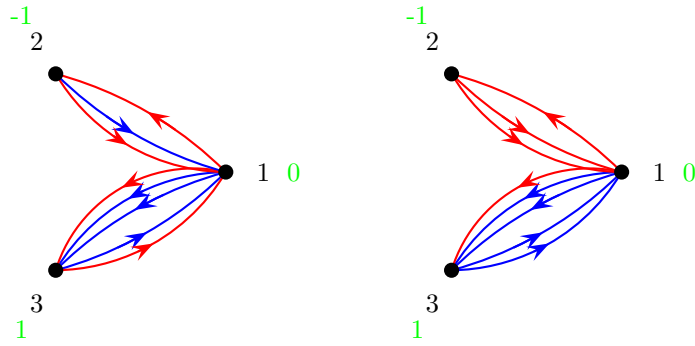
Orbit Size 2



Move Graph

$12123 \ 32121 \ 12121 \ 12321$
 $-x_{1,2,1,2,3} * x_{3,2,1,2,1} + x_{1,2,1,2,1} * x_{1,2,3,2,1}$

Orbit Size 2

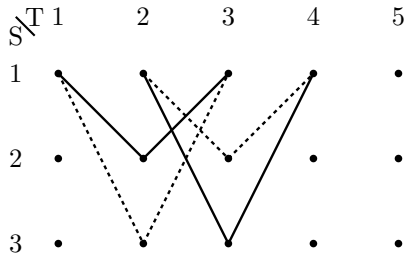
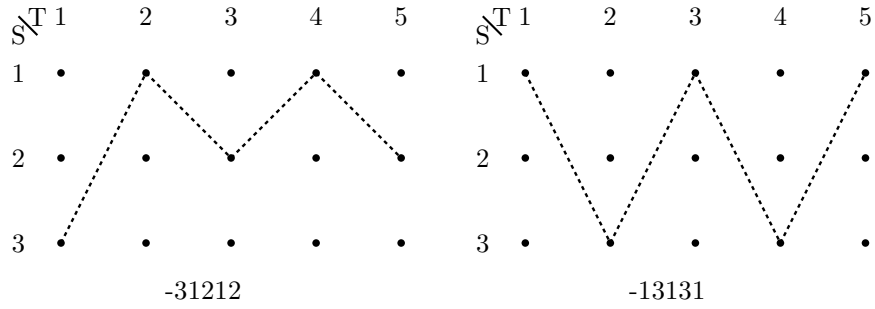
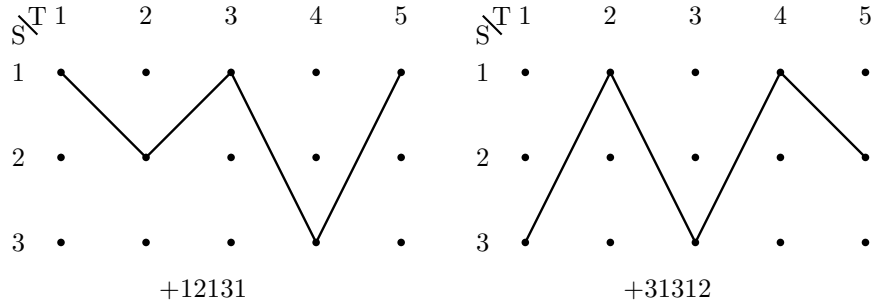
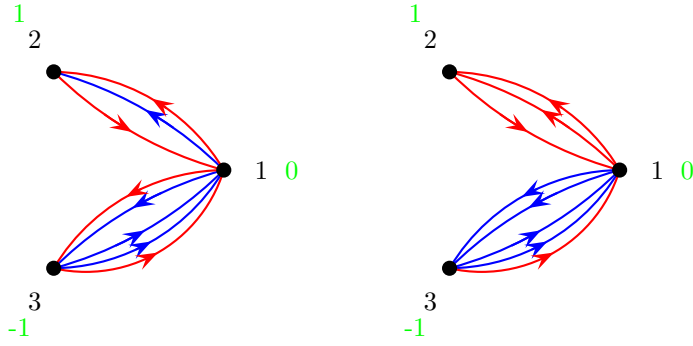


Move Graph

$$12131 \ 21313 \ 21213 \ 13131$$

$$-x_{1,2,1,3,1} * x_{2,1,3,1,3} + x_{2,1,2,1,3} * x_{1,3,1,3,1}$$

Orbit Size 2

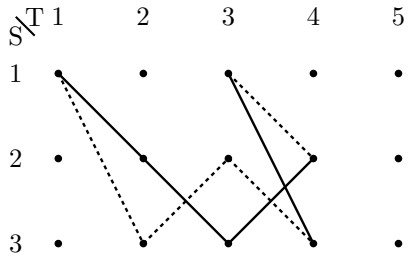
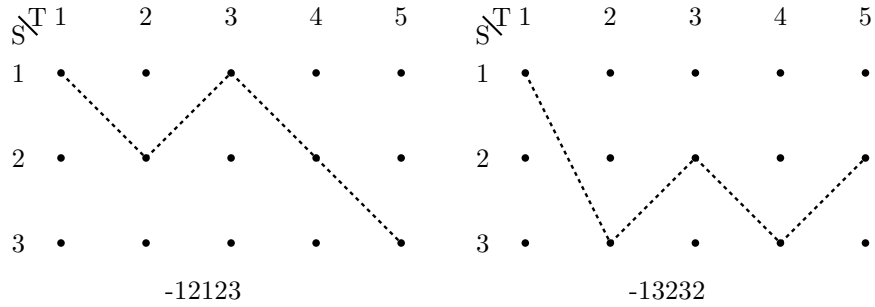
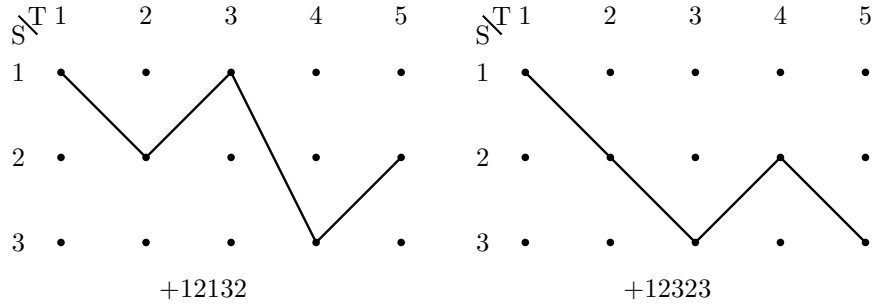
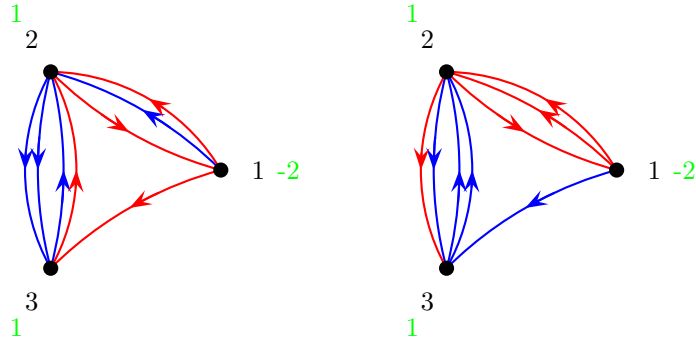


Move Graph

$$12131 \ 31312 \ 31212 \ 13131$$

$$-x_{1,2,1,3,1} * x_{3,1,3,1,2} + x_{3,1,2,1,2} * x_{1,3,1,3,1}$$

Orbit Size 2

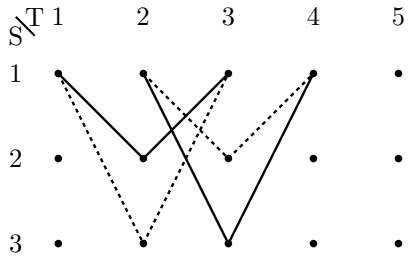
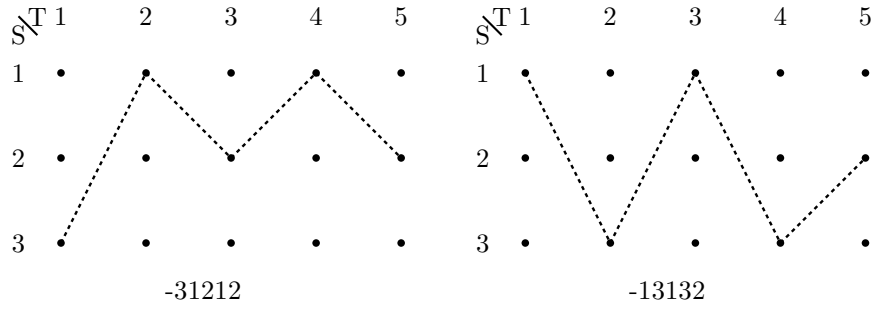
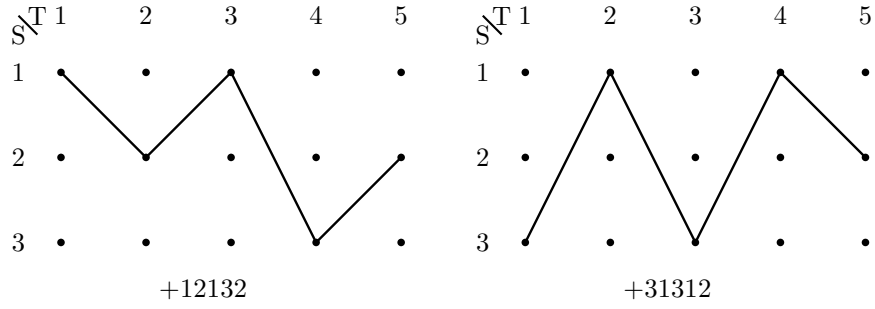
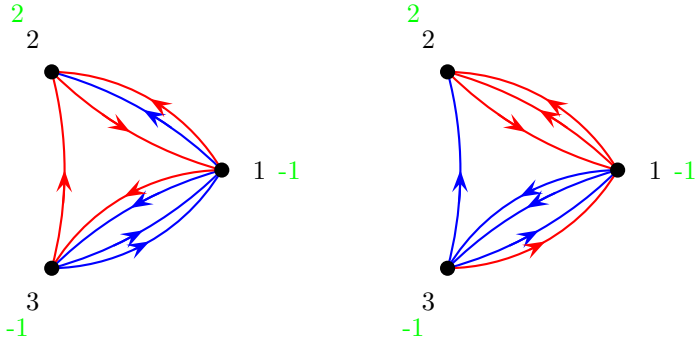


Move Graph

$$12132 \ 12323 \ 12123 \ 13232$$

$$-x_{1,2,1,3,2} * x_{1,2,3,2,3} + x_{1,2,1,2,3} * x_{1,3,2,3,2}$$

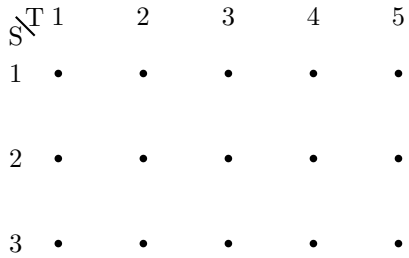
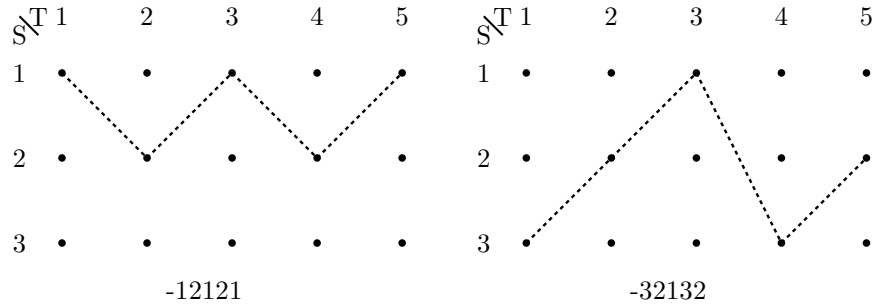
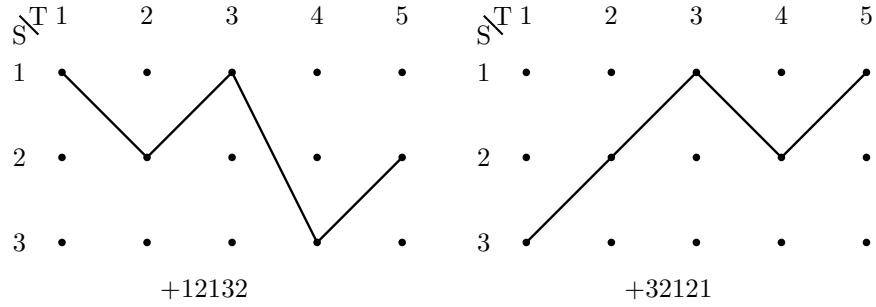
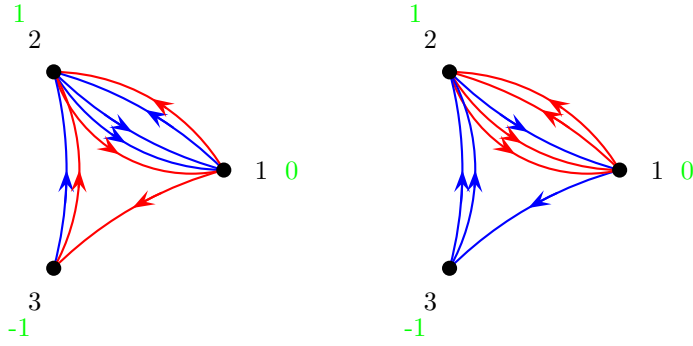
Orbit Size 2



Move Graph

12132 31312 31212 13132
 $-x_{1,2,1,3,2} * x_{3,1,3,1,2} + x_{3,1,2,1,2} * x_{1,3,1,3,2}$

Orbit Size 2

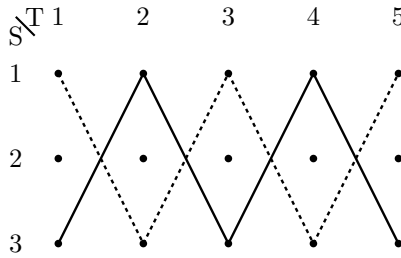
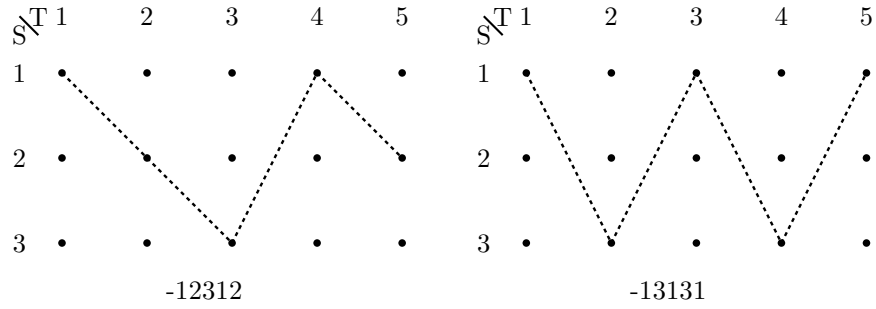
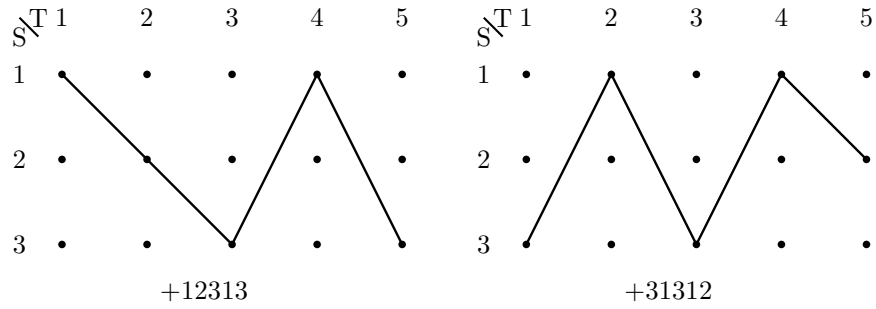
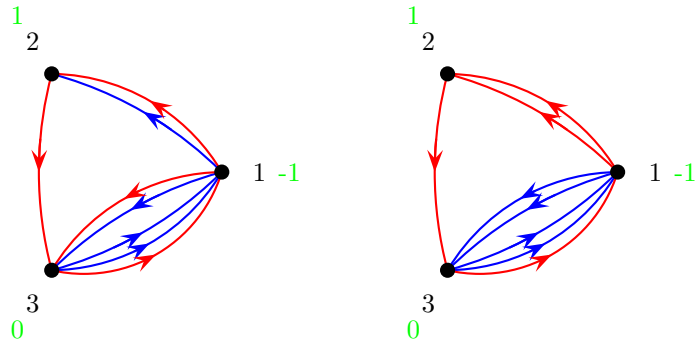


Move Graph

$$12132 \ 32121 \ 12121 \ 32132$$

$$-x_{1,2,1,3,2} * x_{3,2,1,2,1} + x_{1,2,1,2,1} * x_{3,2,1,3,2}$$

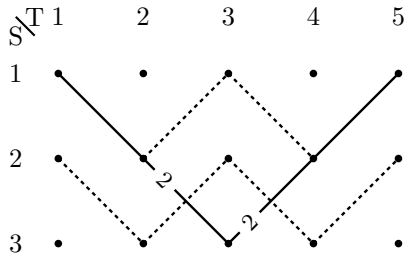
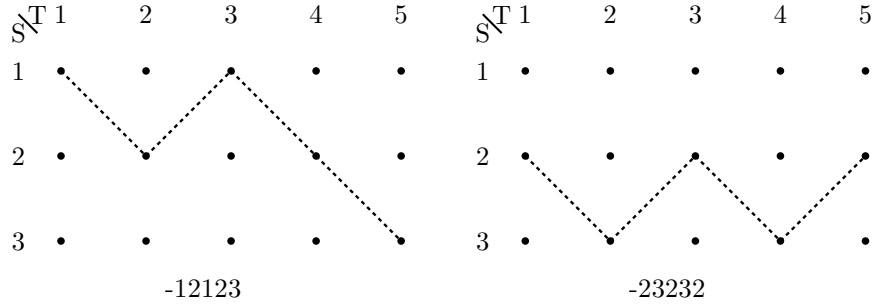
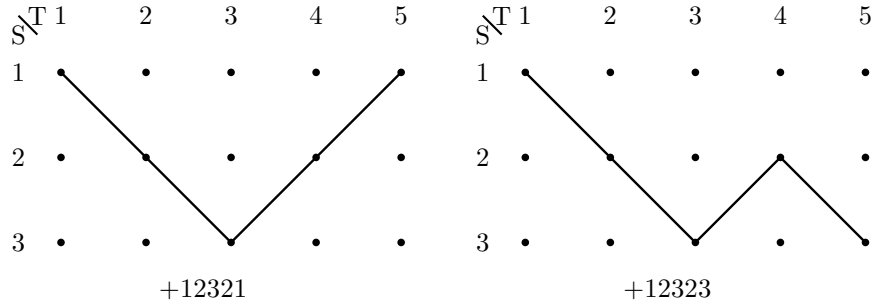
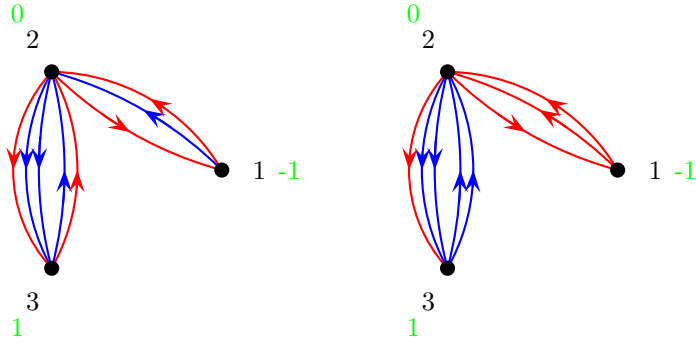
Orbit Size 2



Move Graph

12313 31312 12312 13131
 $-x_{1,2,3,1,3} * x_{3,1,3,1,2} + x_{1,2,3,1,2} * x_{1,3,1,3,1}$

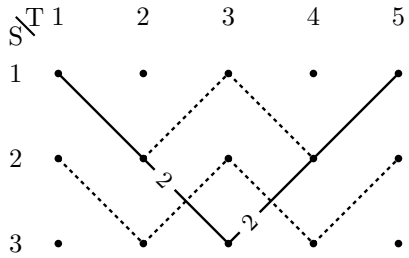
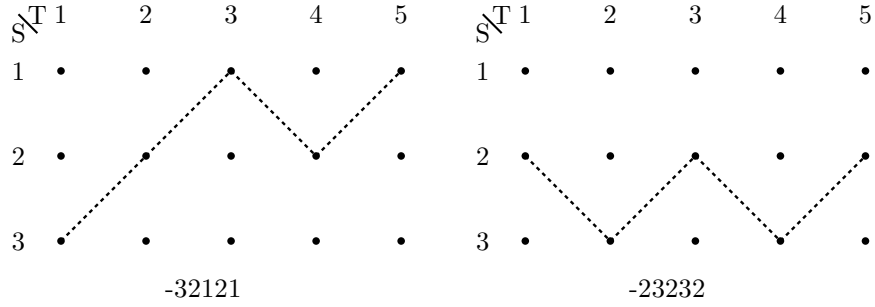
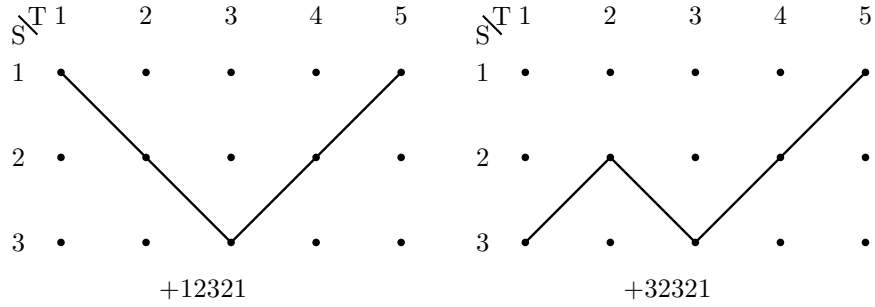
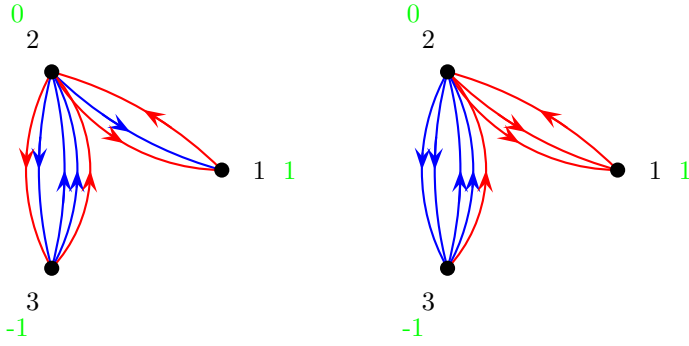
Orbit Size 2



Move Graph

12321 12323 12123 23232
 $-x_{1,2,3,2,1} * x_{1,2,3,2,3} + x_{1,2,1,2,3} * x_{2,3,2,3,2}$

Orbit Size 2

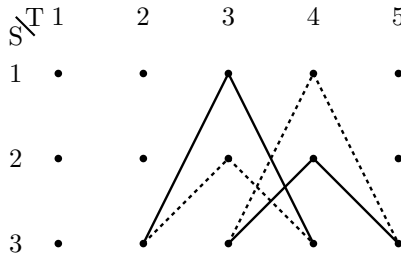
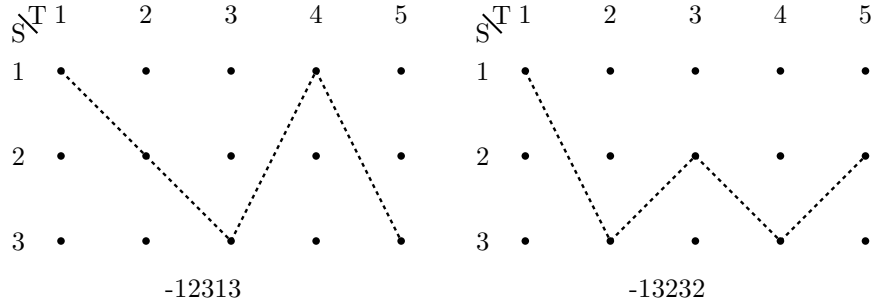
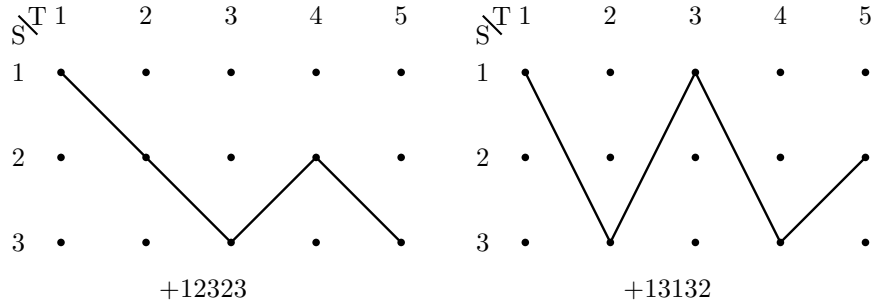
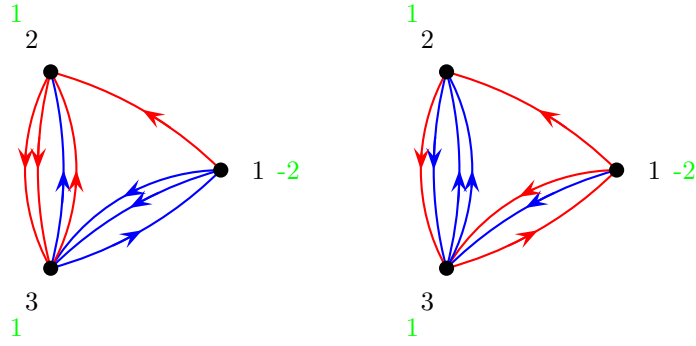


Move Graph

$$12321 \ 32321 \ 32121 \ 23232$$

$$-x_{1,2,3,2,1} * x_{3,2,3,2,1} + x_{3,2,1,2,1} * x_{2,3,2,3,2}$$

Orbit Size 2

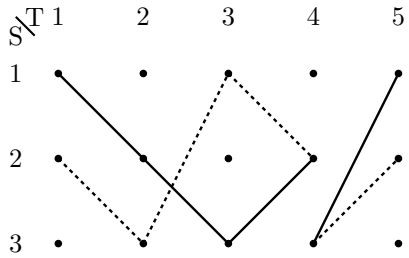
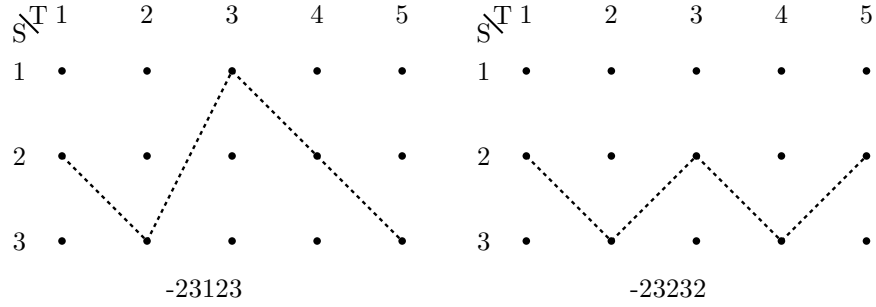
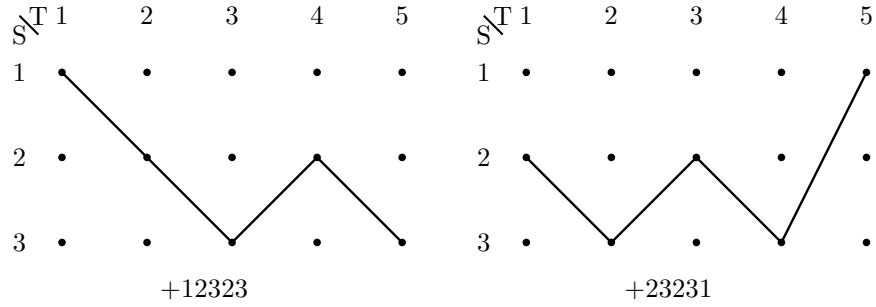
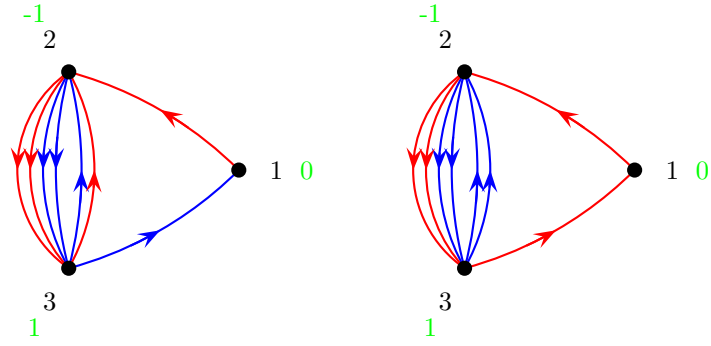


Move Graph

$$12323 \ 13132 \ 12313 \ 13232$$

$$-x_{1,2,3,2,3} * x_{1,3,1,3,2} + x_{1,2,3,1,3} * x_{1,3,2,3,2}$$

Orbit Size 2

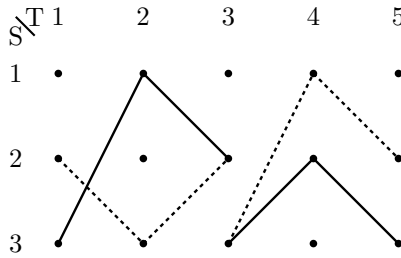
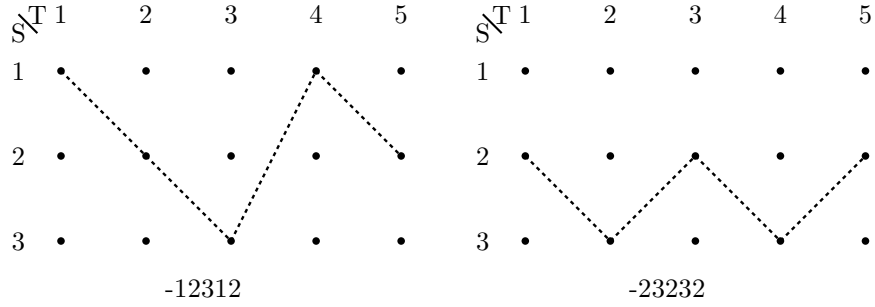
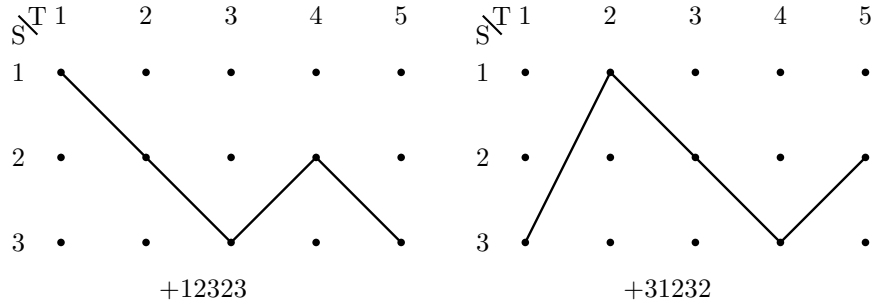
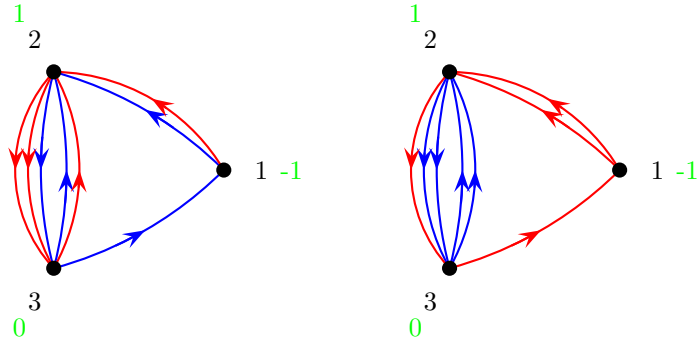


Move Graph

$$12323 \quad 23231 \quad 23123 \quad 23232$$

$$-x_{1,2,3,2,3} * x_{2,3,2,3,1} + x_{2,3,1,2,3} * x_{2,3,2,3,2}$$

Orbit Size 2

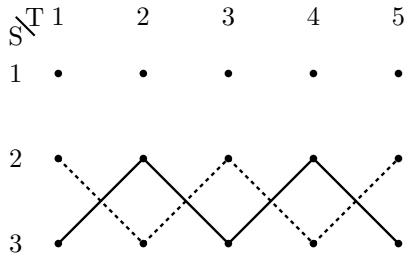
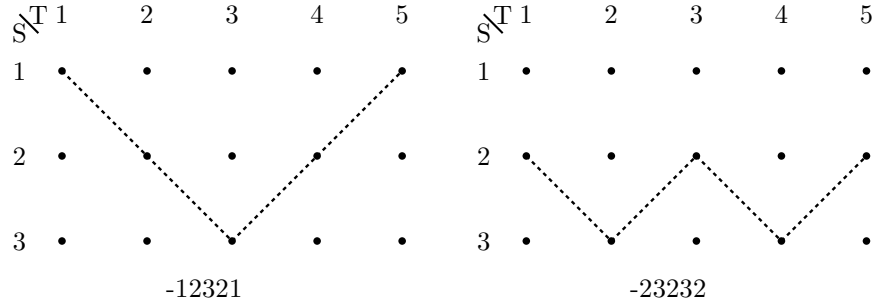
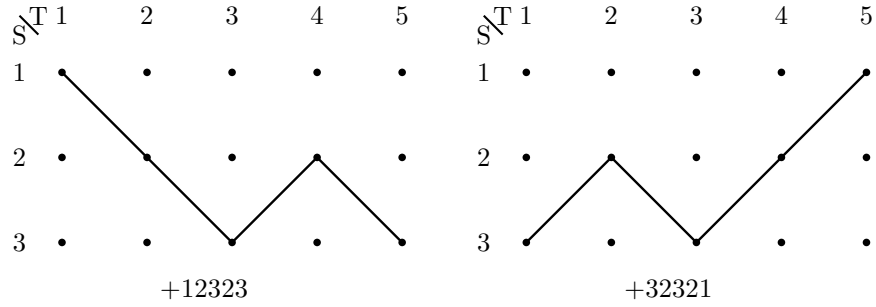
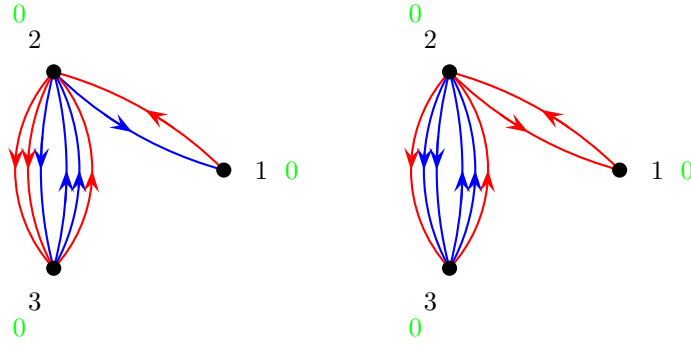


Move Graph

$$12323 \ 31232 \ 12312 \ 23232$$

$$-x_{1,2,3,2,3} * x_{3,1,2,3,2} + x_{1,2,3,1,2} * x_{2,3,2,3,2}$$

Orbit Size 2

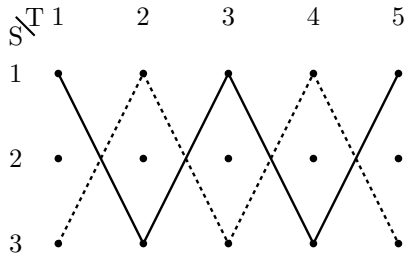
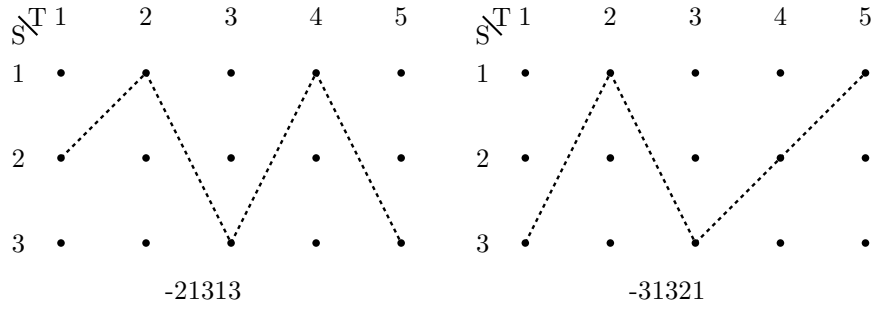
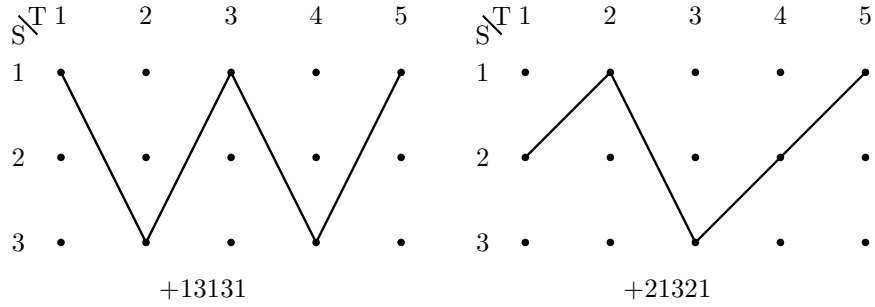
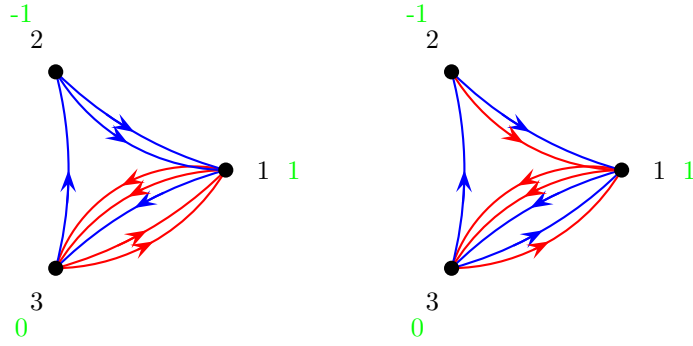


Move Graph

$$12323 \ 32321 \ 12321 \ 23232$$

$$-x_{1,2,3,2,3} * x_{3,2,3,2,1} + x_{1,2,3,2,1} * x_{2,3,2,3,2}$$

Orbit Size 2

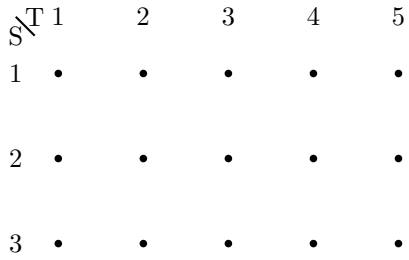
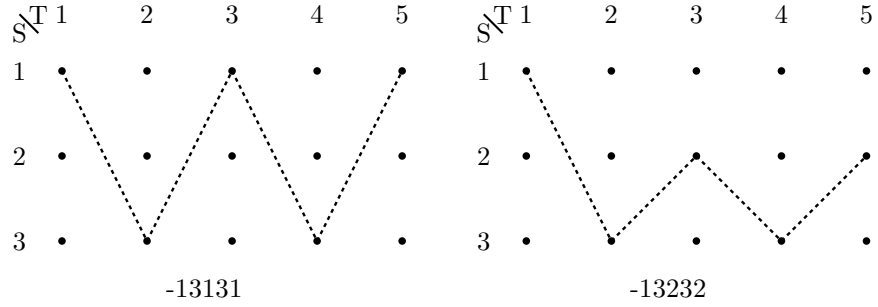
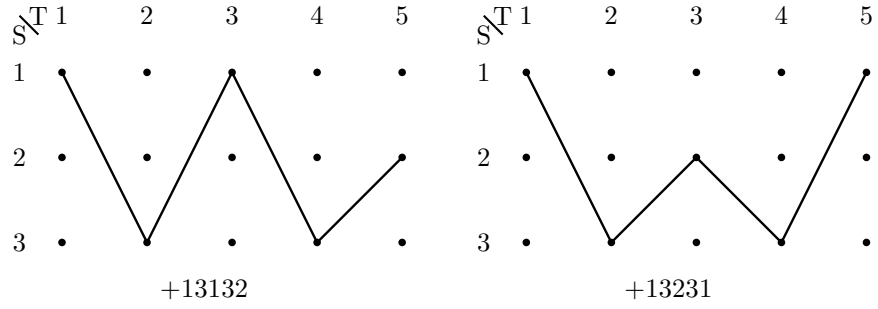
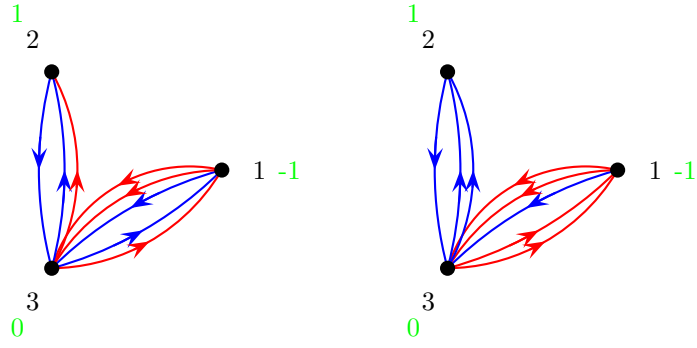


Move Graph

$$13131 \ 21321 \ 21313 \ 31321$$

$$-x_{1,3,1,3,1} * x_{2,1,3,2,1} + x_{2,1,3,1,3} * x_{3,1,3,2,1}$$

Orbit Size 2

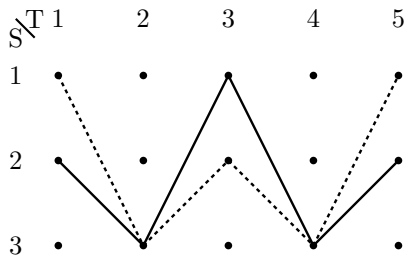
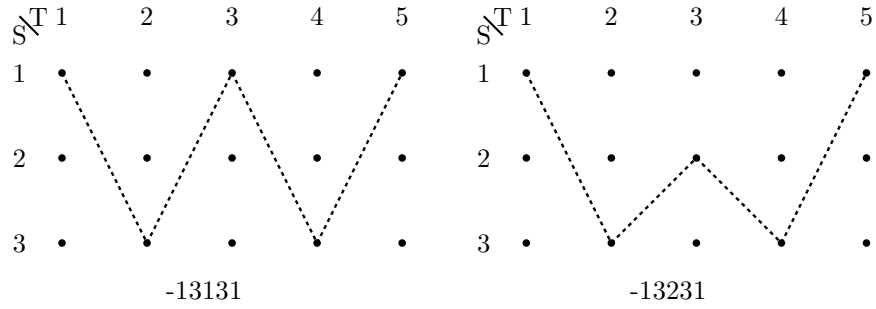
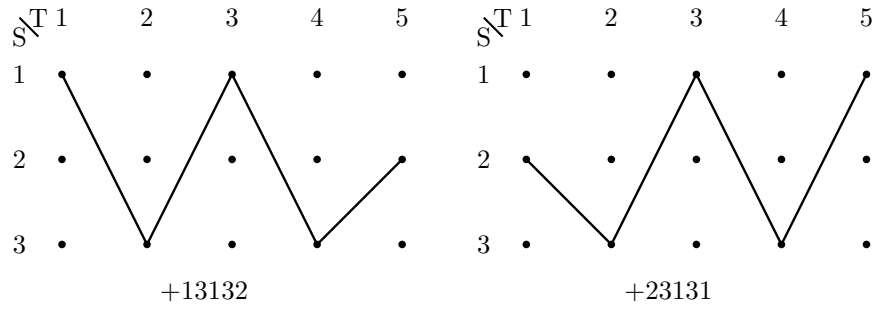
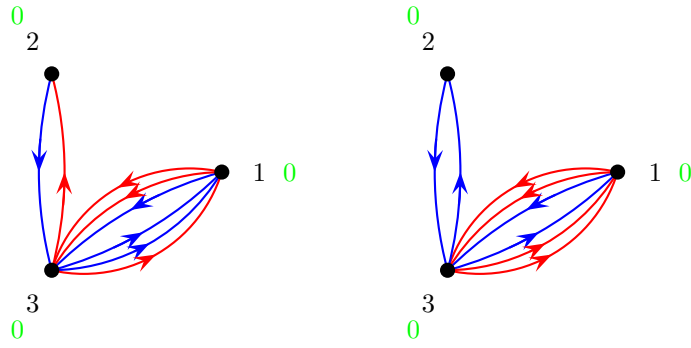


Move Graph

$$13132 \ 13231 \ 13131 \ 13232$$

$$-x_{1,3,1,3,2} * x_{1,3,2,3,1} + x_{1,3,1,3,1} * x_{1,3,2,3,2}$$

Orbit Size 2

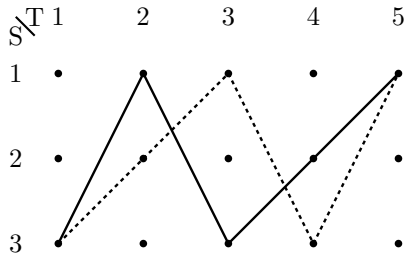
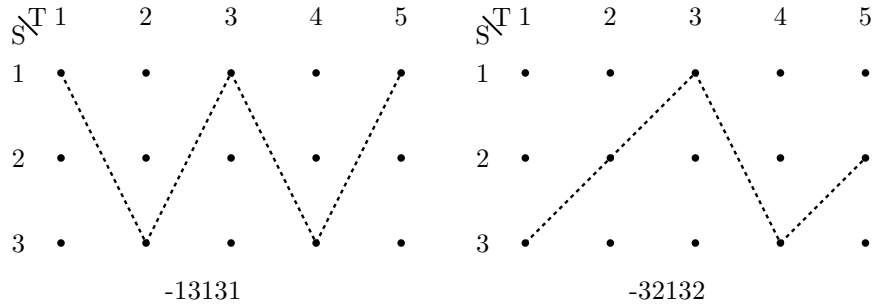
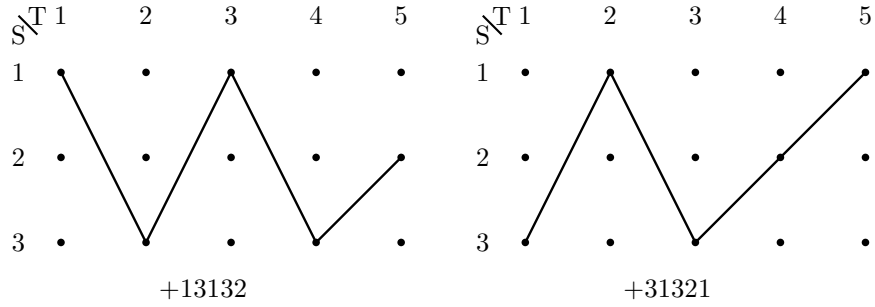
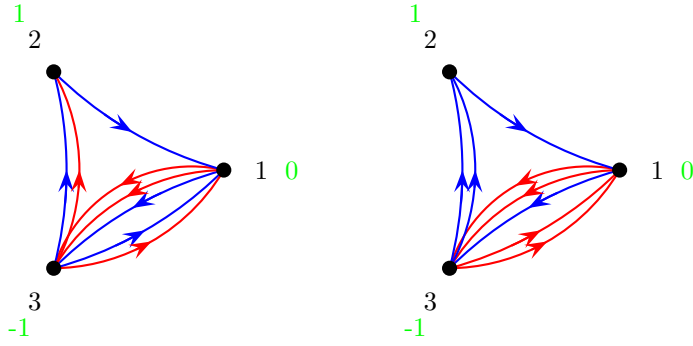


Move Graph

$$13132 \ 23131 \ 13131 \ 13231$$

$$-x_{1,3,1,3,2} * x_{2,3,1,3,1} + x_{1,3,1,3,1} * x_{1,3,2,3,1}$$

Orbit Size 2

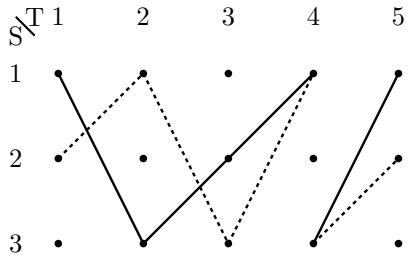
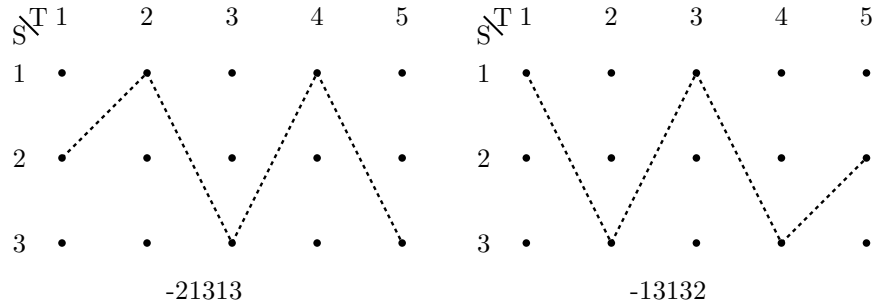
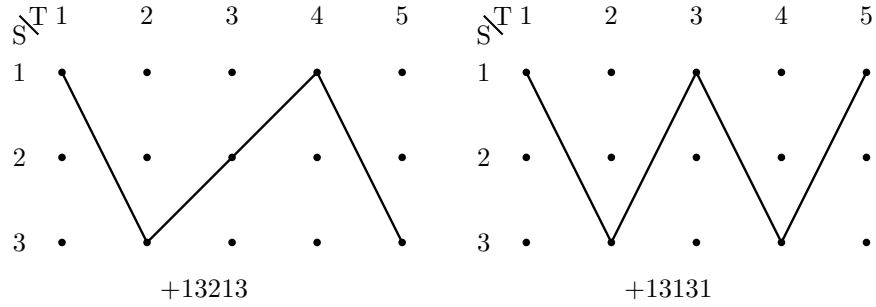
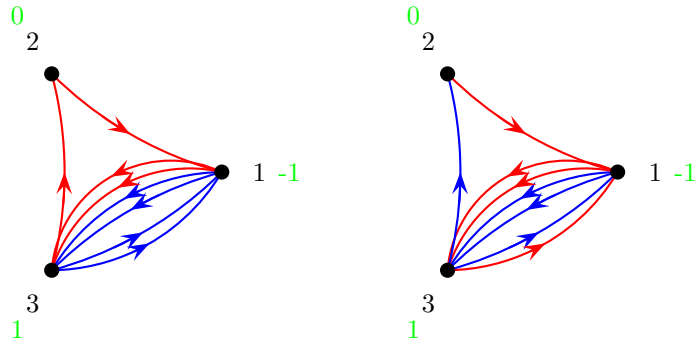


Move Graph

$$13132 \ 31321 \ 13131 \ 32132$$

$$-x_{1,3,1,3,2} * x_{3,1,3,2,1} + x_{1,3,1,3,1} * x_{3,2,1,3,2}$$

Orbit Size 2

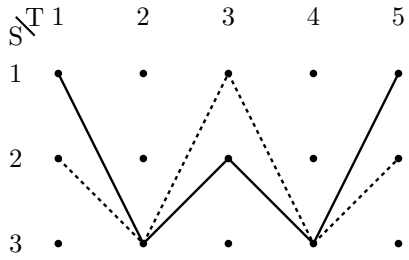
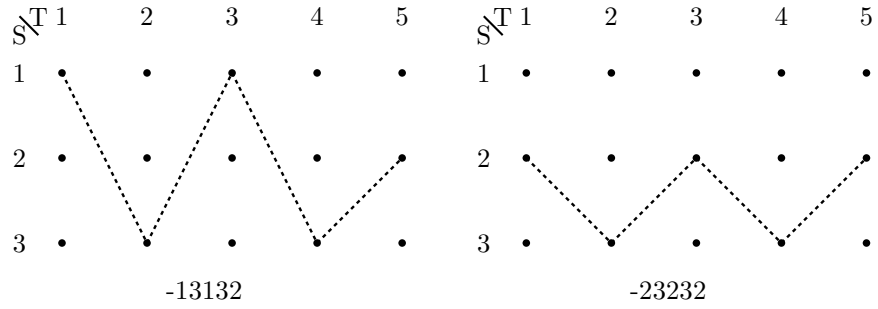
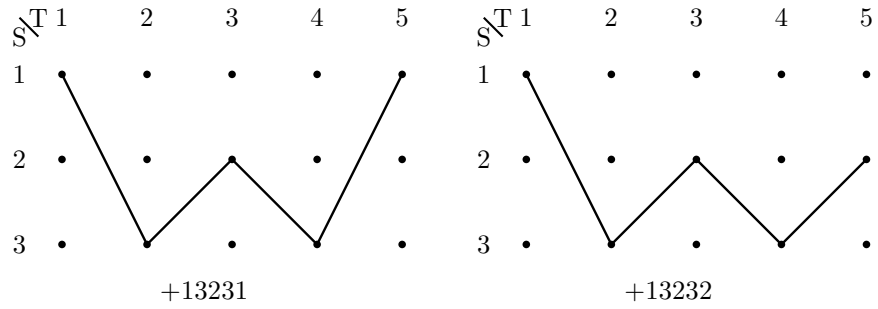
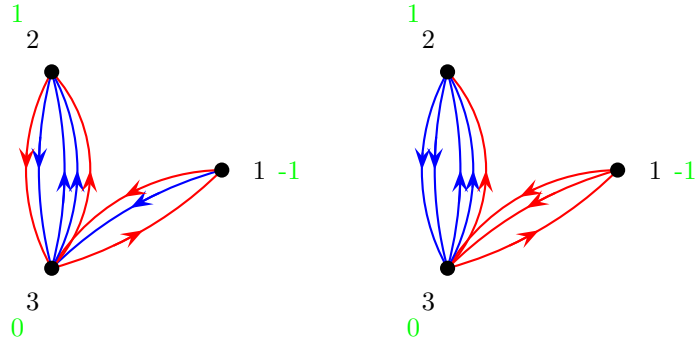


Move Graph

$$13213 \ 13131 \ 21313 \ 13132$$

$$-x_{1,3,2,1,3} * x_{1,3,1,3,1} + x_{2,1,3,1,3} * x_{1,3,1,3,2}$$

Orbit Size 2

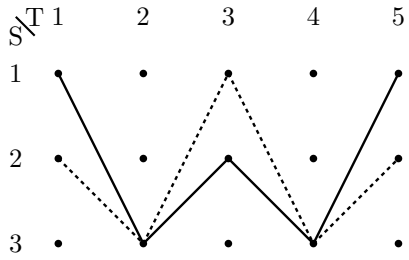
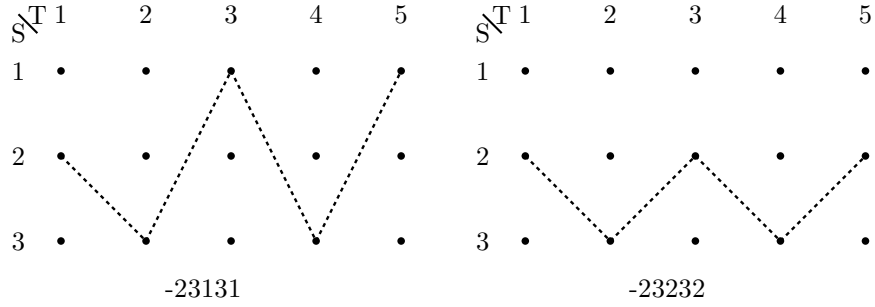
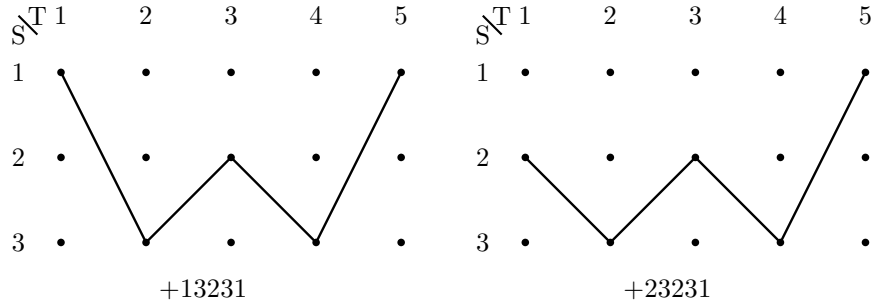
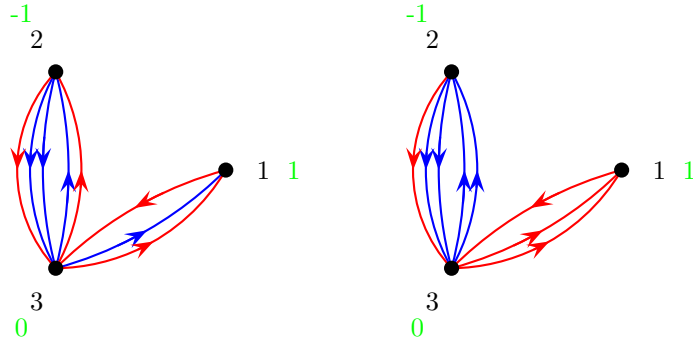


Move Graph

$$13231 \ 13232 \ 13132 \ 23232$$

$$-x_{1,3,2,3,1} * x_{1,3,2,3,2} + x_{1,3,1,3,2} * x_{2,3,2,3,2}$$

Orbit Size 2

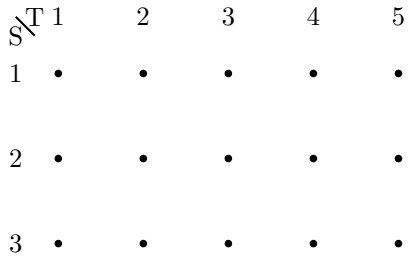
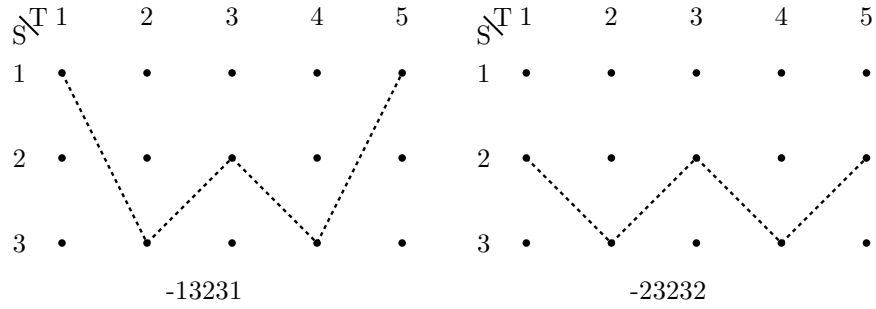
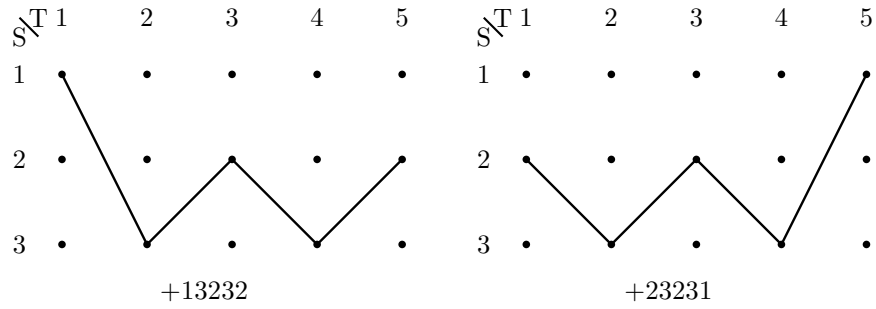
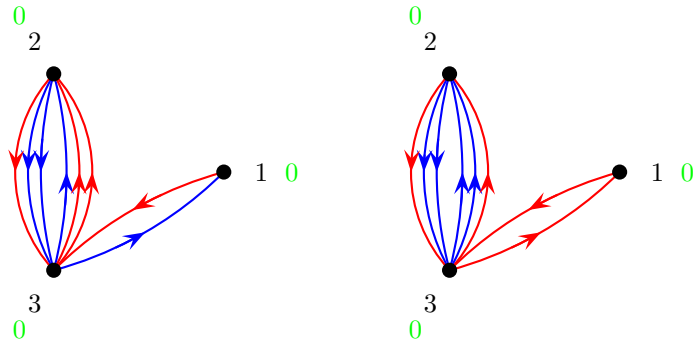


Move Graph

$$13231 \ 23231 \ 23131 \ 23232$$

$$-x_{1,3,2,3,1} * x_{2,3,2,3,1} + x_{2,3,1,3,1} * x_{2,3,2,3,2}$$

Orbit Size 2

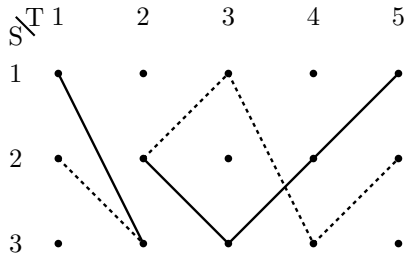
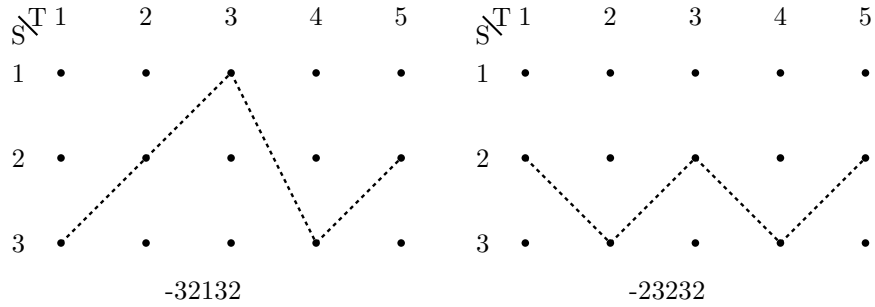
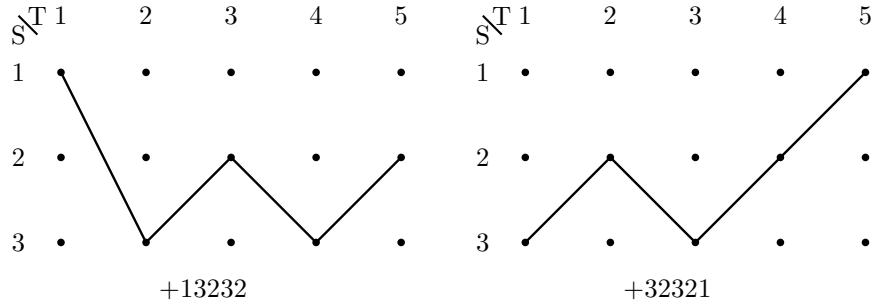
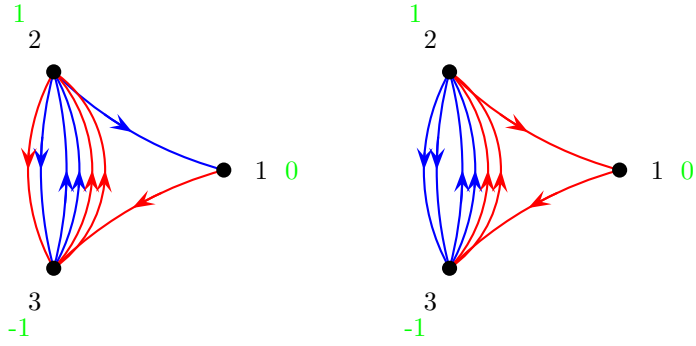


Move Graph

$$13232 \ 23231 \ 13231 \ 23232$$

$$-x_{1,3,2,3,2} * x_{2,3,2,3,1} + x_{1,3,2,3,1} * x_{2,3,2,3,2}$$

Orbit Size 2

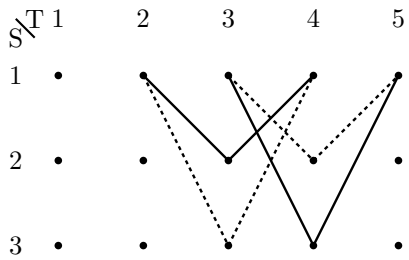
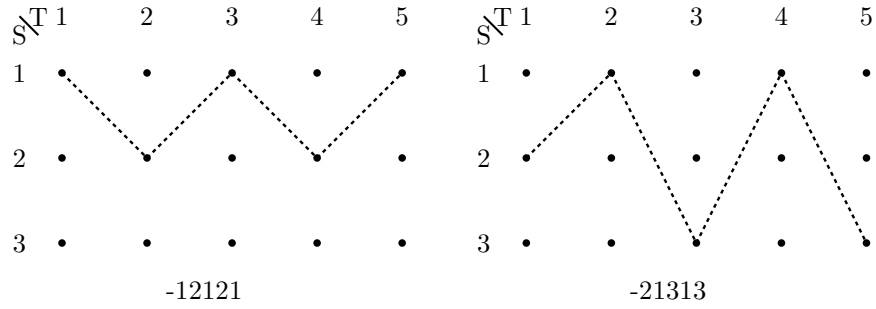
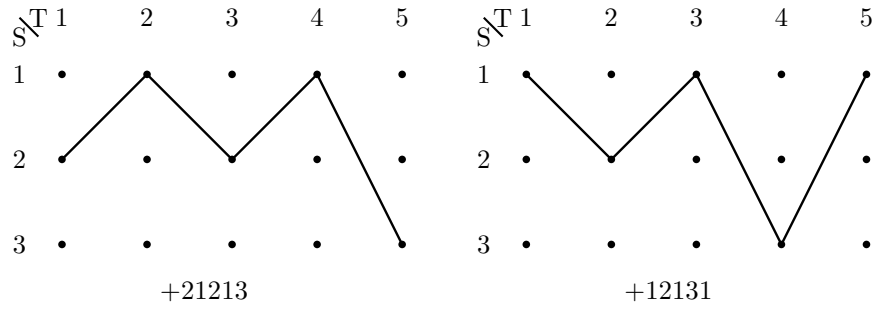
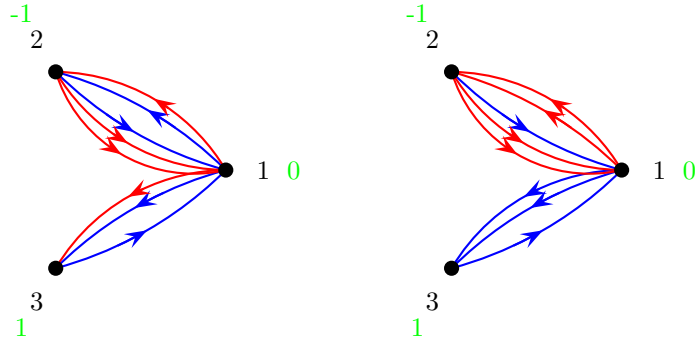


Move Graph

$$13232 \ 32321 \ 32132 \ 23232$$

$$-x_{1,3,2,3,2} * x_{3,2,3,2,1} + x_{3,2,1,3,2} * x_{2,3,2,3,2}$$

Orbit Size 2

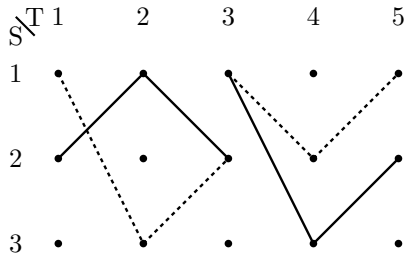
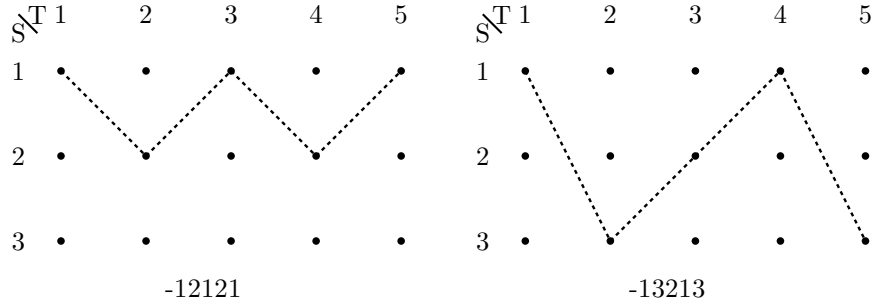
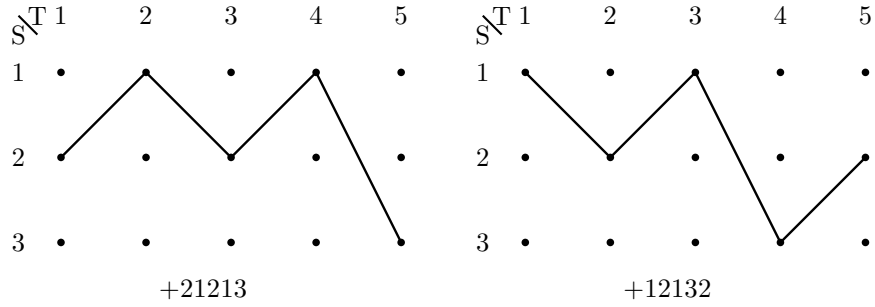
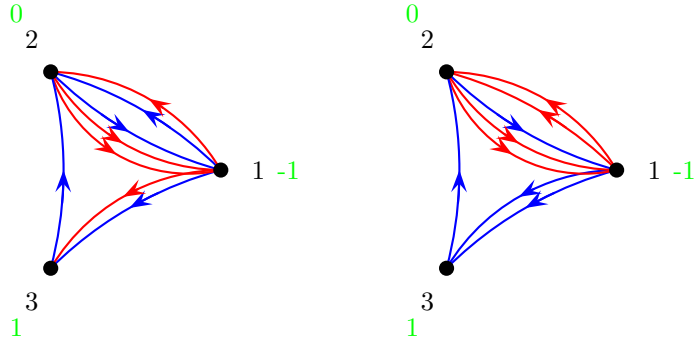


Move Graph

$$21213 \ 12131 \ 12121 \ 21313$$

$$-x_{2,1,2,1,3} * x_{1,2,1,3,1} + x_{1,2,1,2,1} * x_{2,1,3,1,3}$$

Orbit Size 2

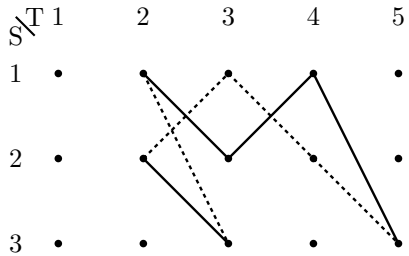
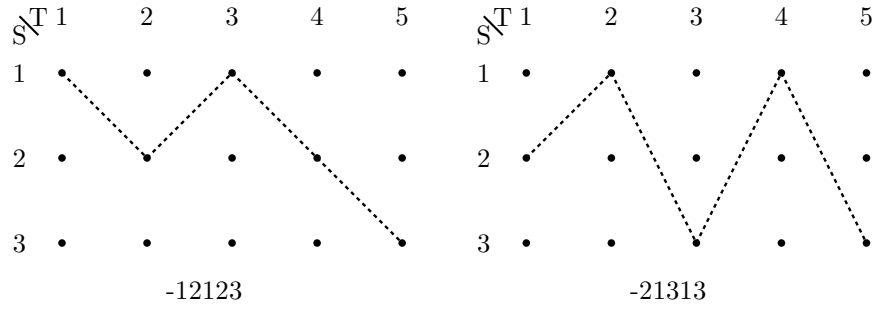
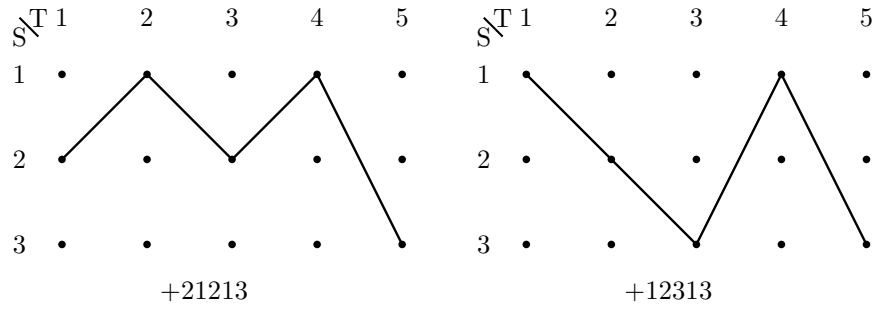
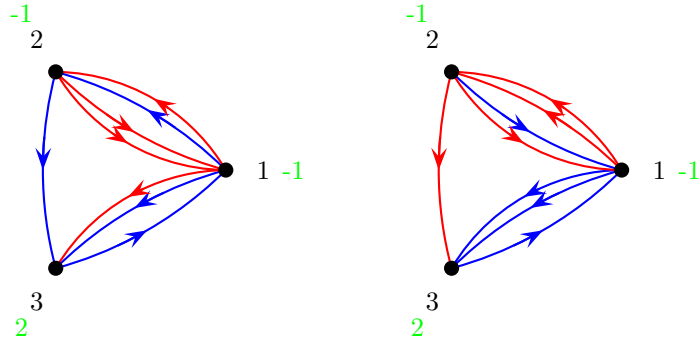


Move Graph

$$21213 \ 12132 \ 12121 \ 13213$$

$$-x_{2,1,2,1,3} * x_{1,2,1,3,2} + x_{1,2,1,2,1} * x_{1,3,2,1,3}$$

Orbit Size 2

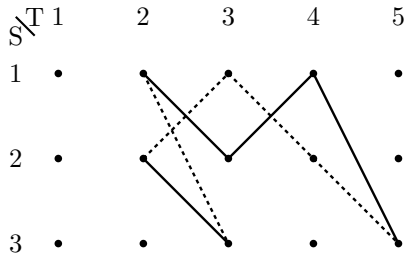
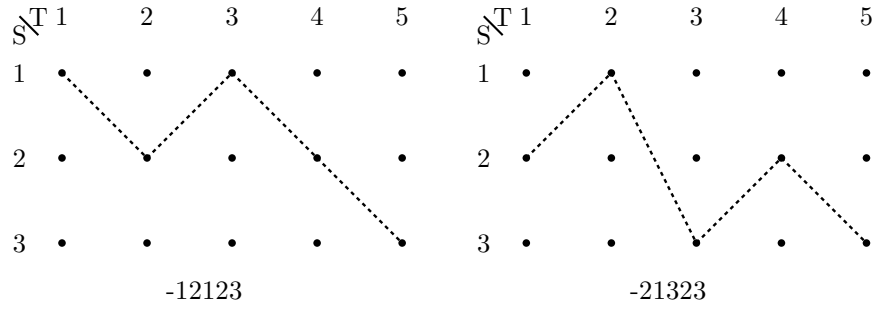
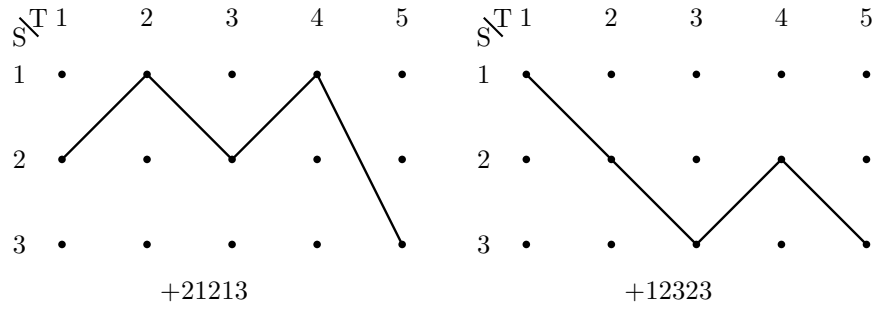
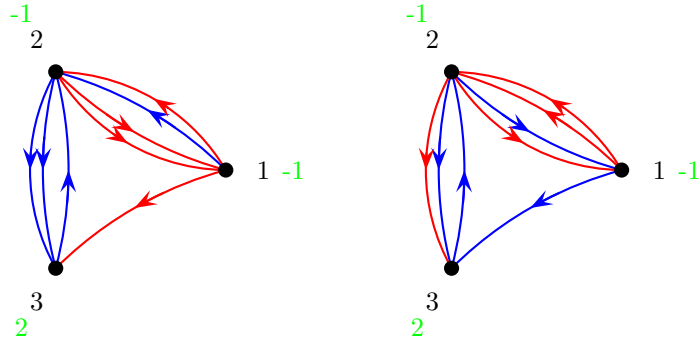


Move Graph

$$21213 \ 12313 \ 12123 \ 21313$$

$$-x_{2,1,2,1,3} * x_{1,2,3,1,3} + x_{1,2,1,2,3} * x_{2,1,3,1,3}$$

Orbit Size 2

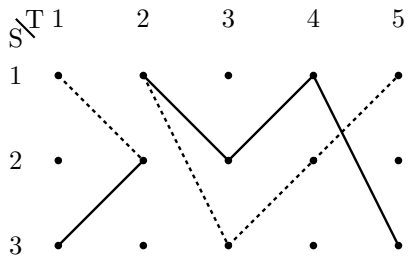
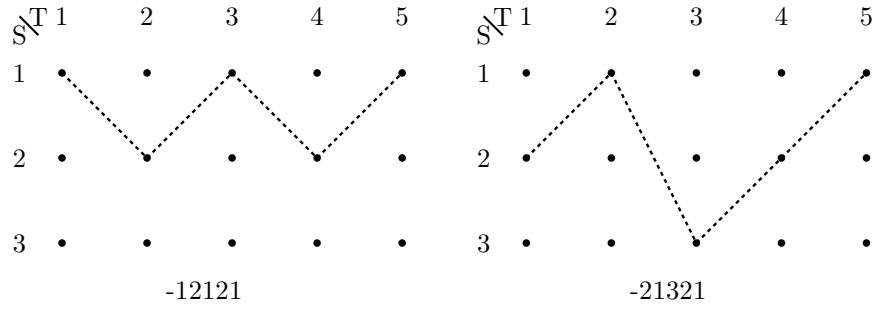
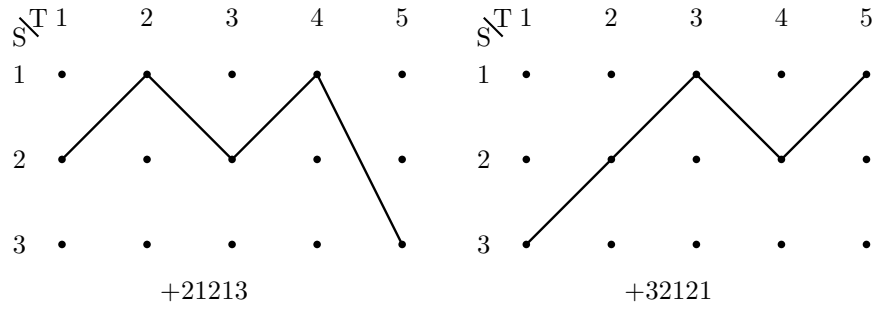
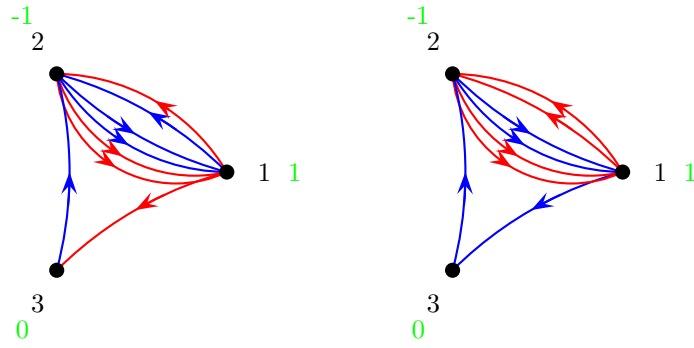


Move Graph

$$21213 \ 12323 \ 12123 \ 21323$$

$$-x_{2,1,2,1,3} * x_{1,2,3,2,3} + x_{1,2,1,2,3} * x_{2,1,3,2,3}$$

Orbit Size 2

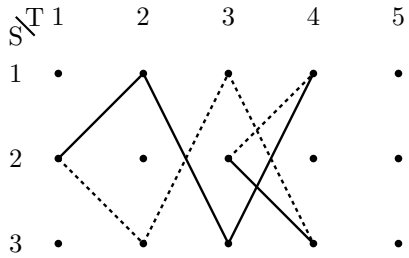
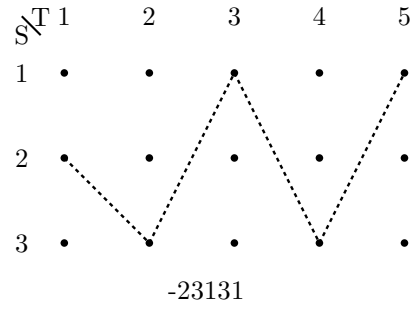
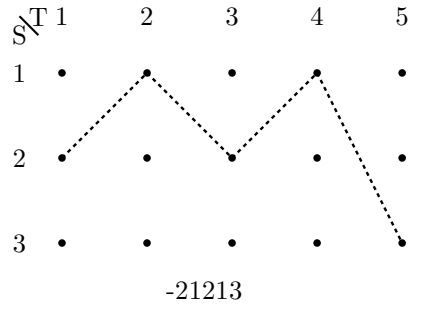
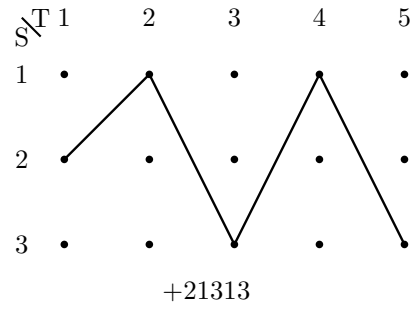
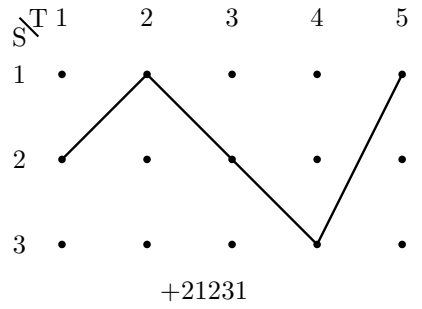
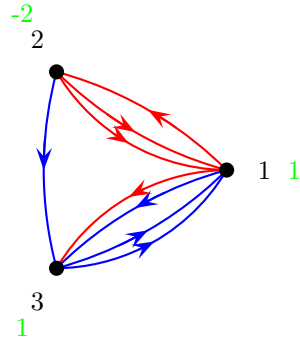
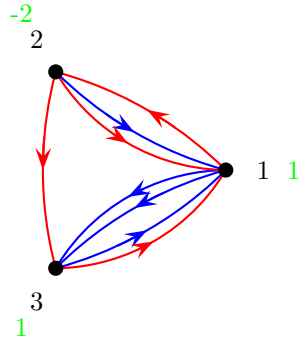


Move Graph

$$21213 \ 32121 \ 12121 \ 21321$$

$$-x_{2,1,2,1,3} * x_{3,2,1,2,1} + x_{1,2,1,2,1} * x_{2,1,3,2,1}$$

Orbit Size 2

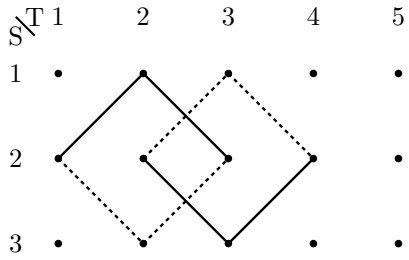
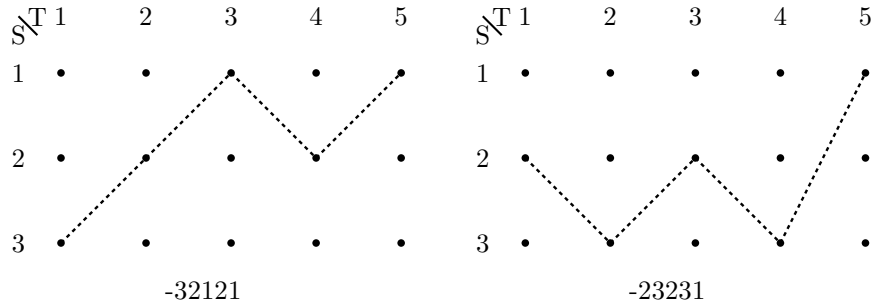
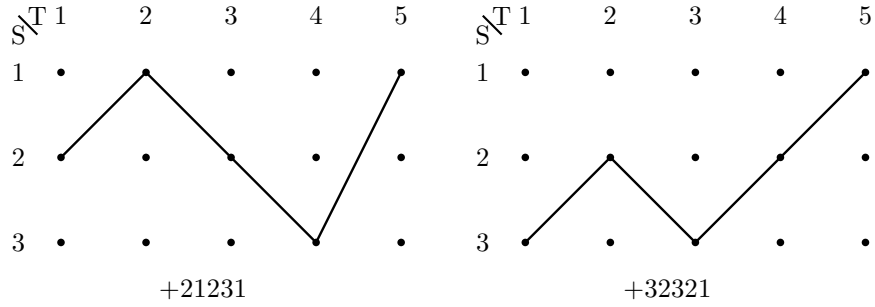
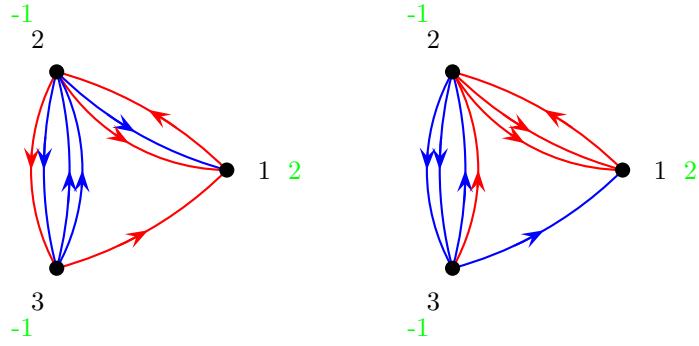


Move Graph

$$21231 \ 21313 \ 21213 \ 23131$$

$$-x_{2,1,2,3,1} * x_{2,1,3,1,3} + x_{2,1,2,1,3} * x_{2,3,1,3,1}$$

Orbit Size 2

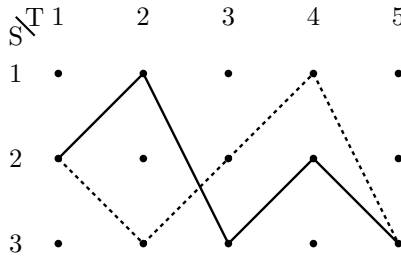
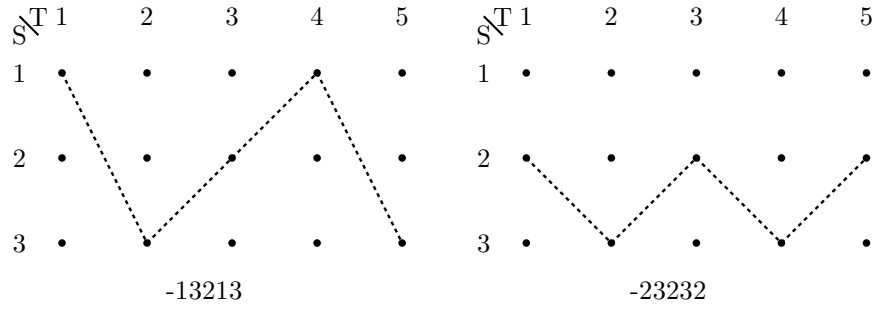
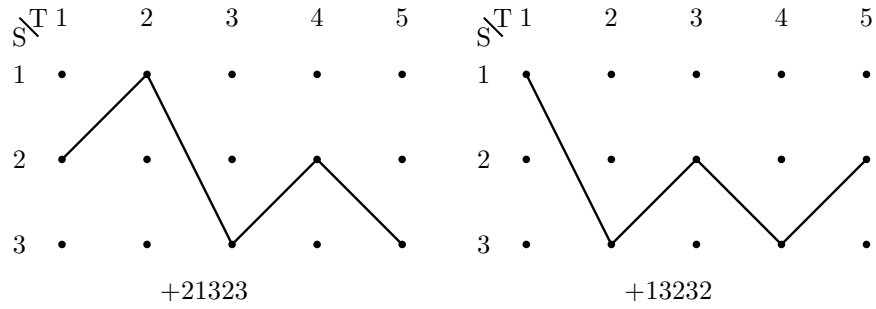
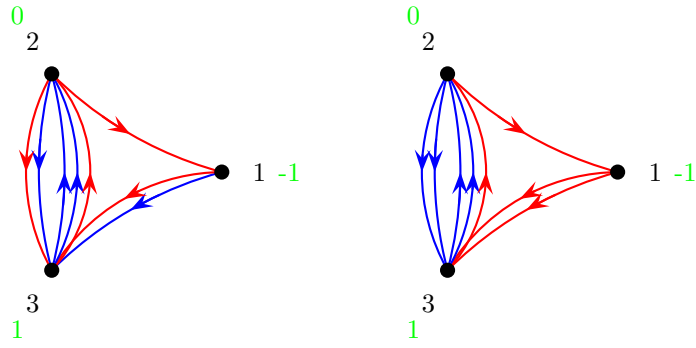


Move Graph

$$21231 \ 32321 \ 32121 \ 23231$$

$$-x_{2,1,2,3,1} * x_{3,2,3,2,1} + x_{3,2,1,2,1} * x_{2,3,2,3,1}$$

Orbit Size 2

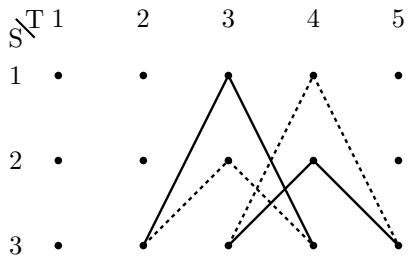
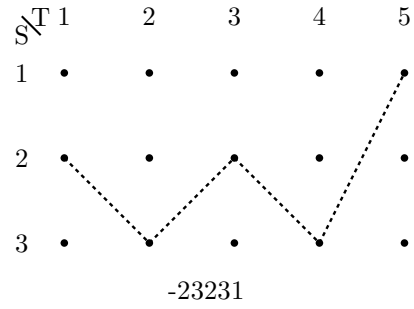
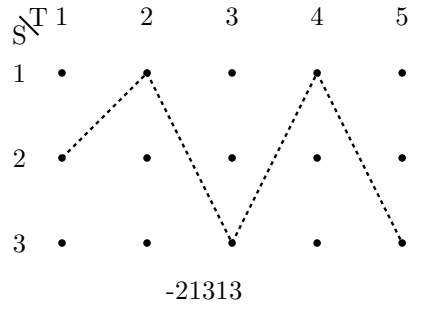
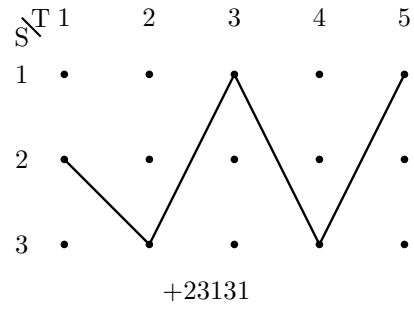
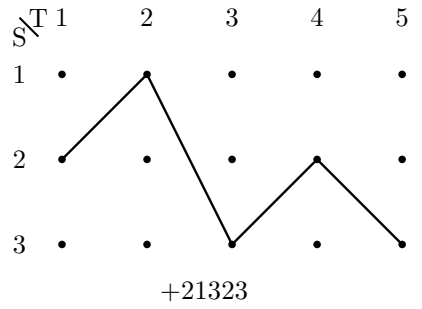
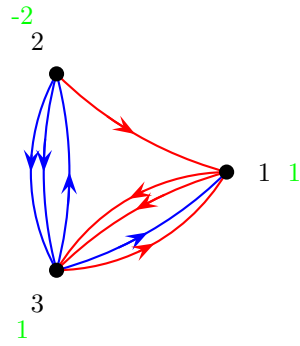
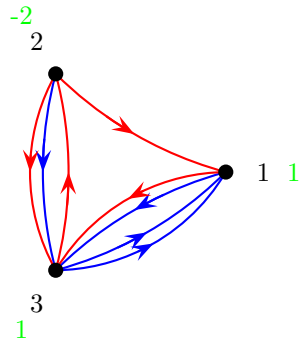


Move Graph

$$21323 \ 13232 \ 13213 \ 23232$$

$$-x_{2,1,3,2,3} * x_{1,3,2,3,2} + x_{1,3,2,1,3} * x_{2,3,2,3,2}$$

Orbit Size 2

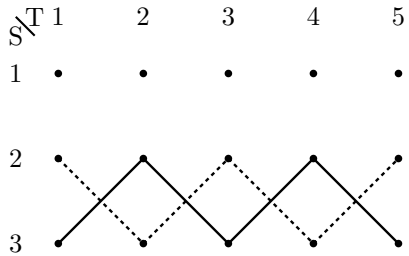
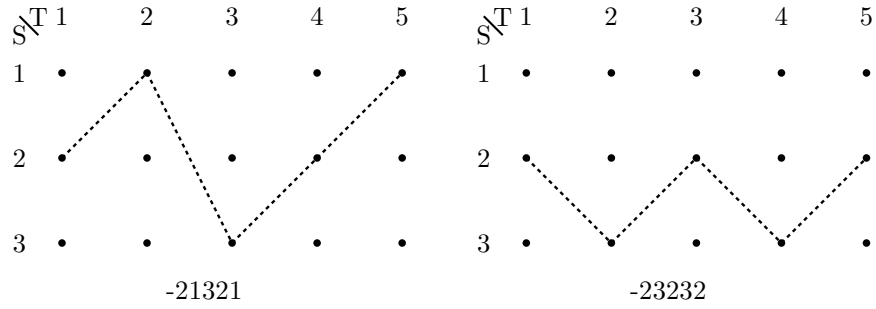
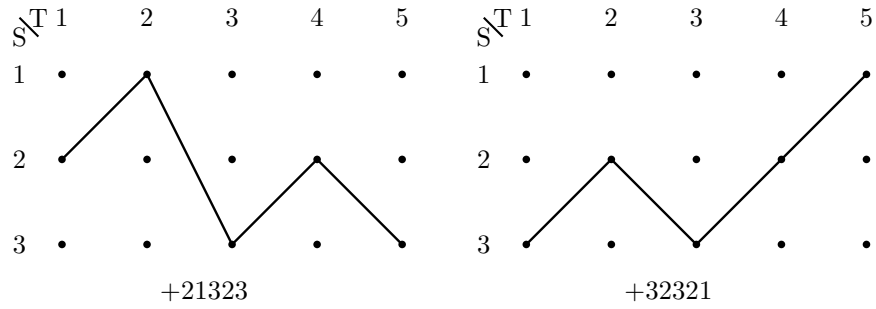
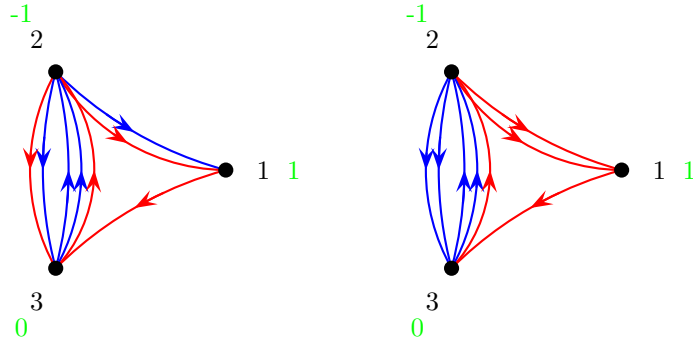


Move Graph

$$21323 \ 23131 \ 21313 \ 23231$$

$$-x_{2,1,3,2,3} * x_{2,3,1,3,1} + x_{2,1,3,1,3} * x_{2,3,2,3,1}$$

Orbit Size 2

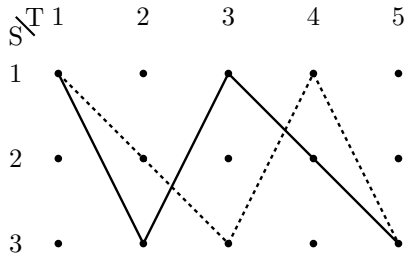
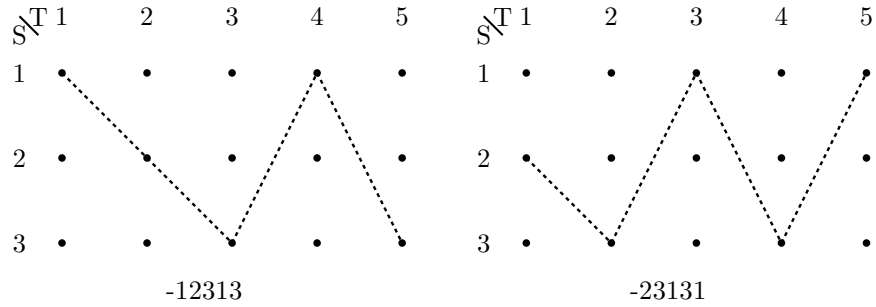
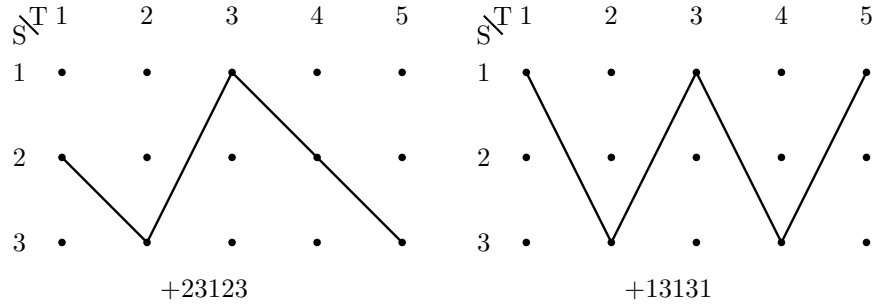
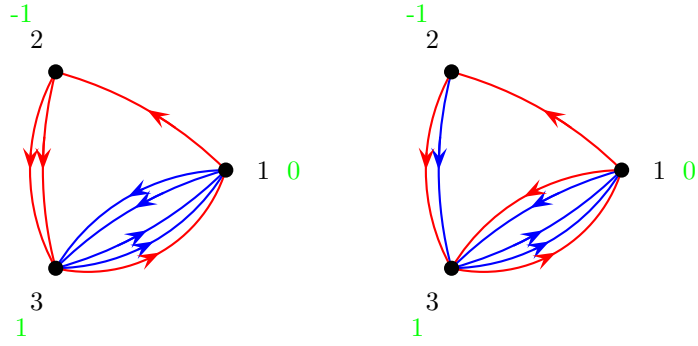


Move Graph

$$21323 \ 32321 \ 21321 \ 23232$$

$$-x_{2,1,3,2,3} * x_{3,2,3,2,1} + x_{2,1,3,2,1} * x_{2,3,2,3,2}$$

Orbit Size 2

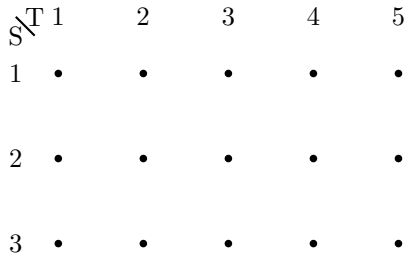
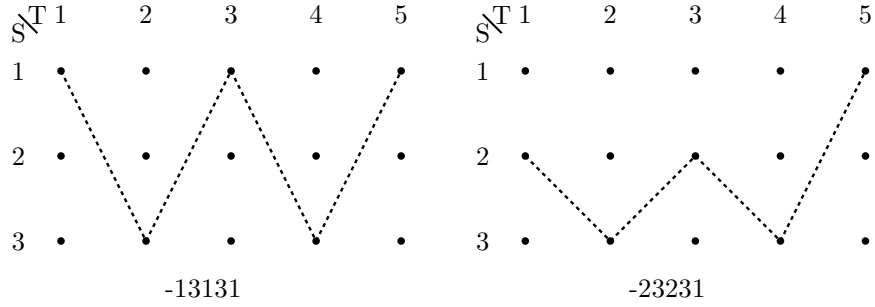
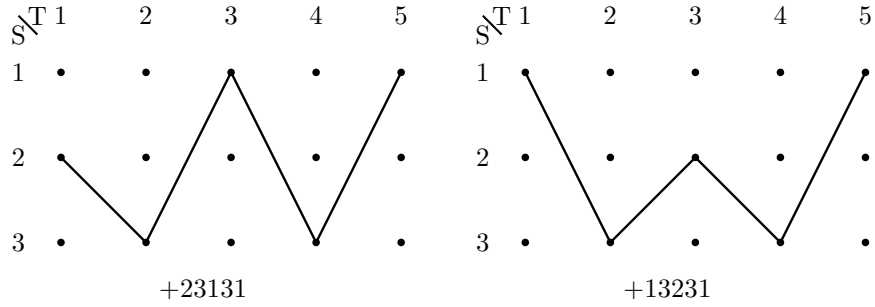
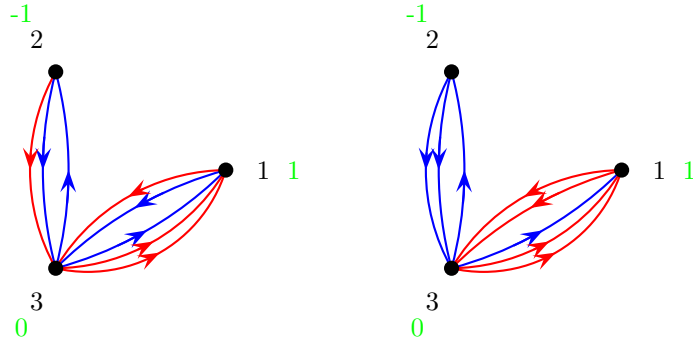


Move Graph

$$23123 \ 13131 \ 12313 \ 23131$$

$$-x_{2,3,1,2,3} * x_{1,3,1,3,1} + x_{1,2,3,1,3} * x_{2,3,1,3,1}$$

Orbit Size 2

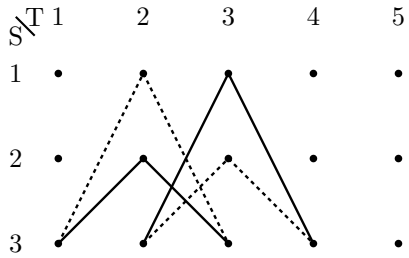
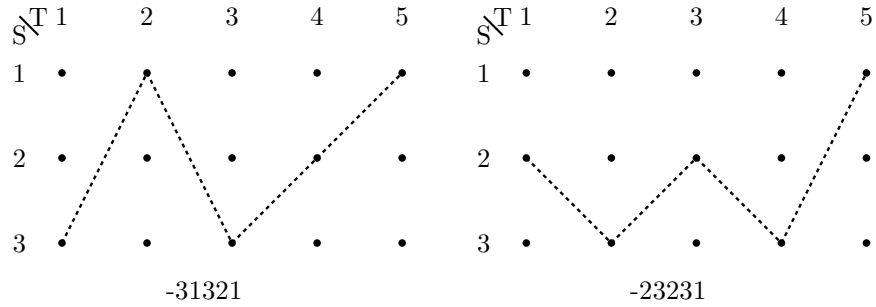
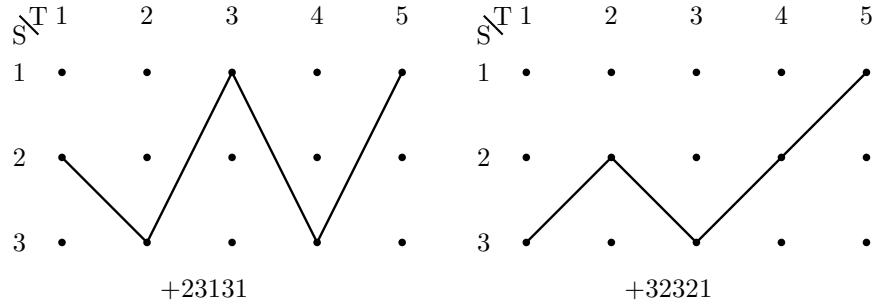
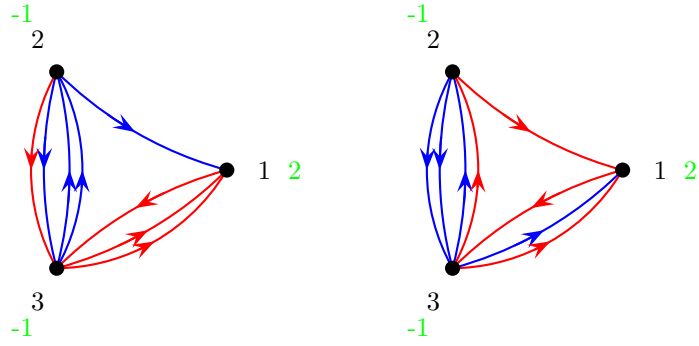


Move Graph

$$23131 \ 13231 \ 13131 \ 23231$$

$$-x_{2,3,1,3,1} * x_{1,3,2,3,1} + x_{1,3,1,3,1} * x_{2,3,2,3,1}$$

Orbit Size 2

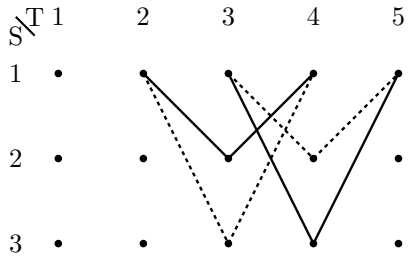
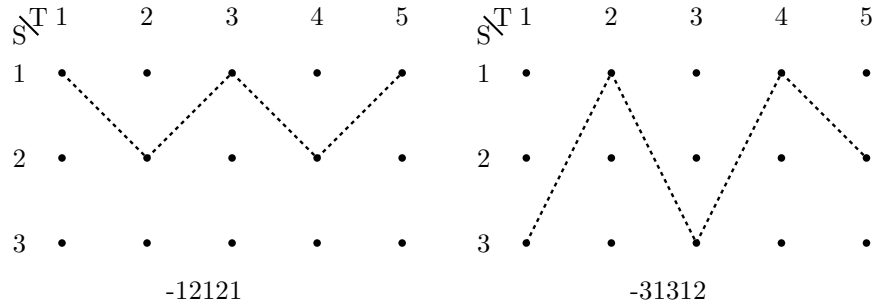
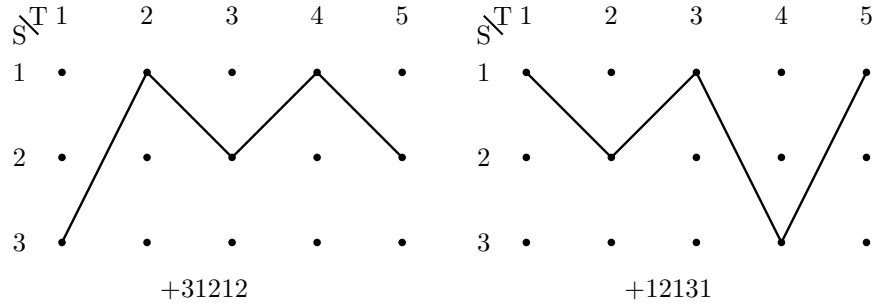
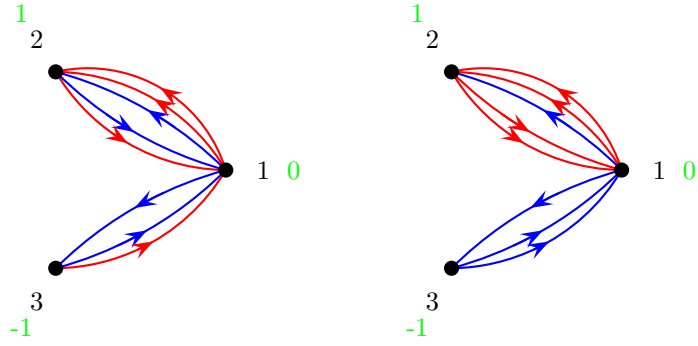


Move Graph

$$23131 \ 32321 \ 31321 \ 23231$$

$$-x_{2,3,1,3,1} * x_{3,2,3,2,1} + x_{3,1,3,2,1} * x_{2,3,2,3,1}$$

Orbit Size 2

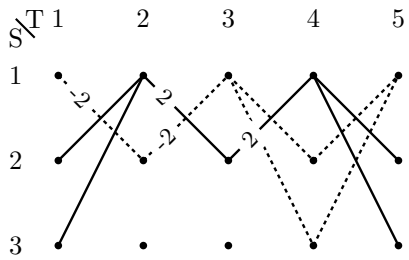
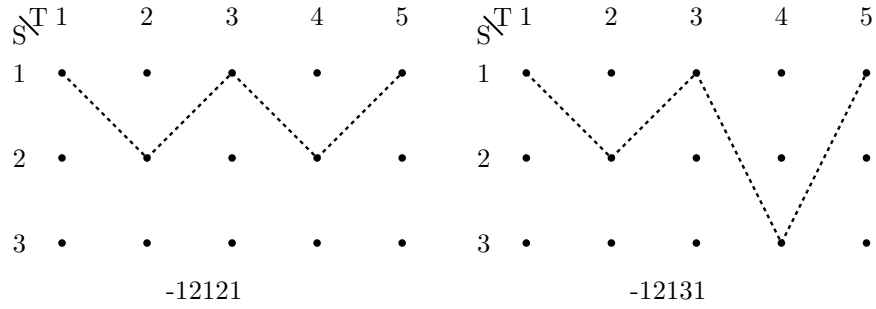
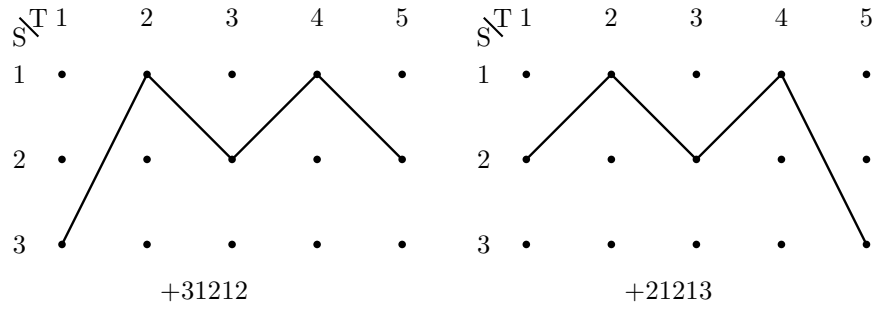
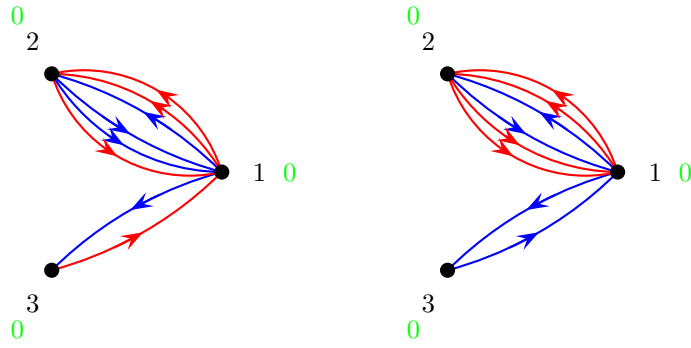


Move Graph

$$31212 \ 12131 \ 12121 \ 31312$$

$$-x_{3,1,2,1,2} * x_{1,2,1,3,1} + x_{1,2,1,2,1} * x_{3,1,3,1,2}$$

Orbit Size 2

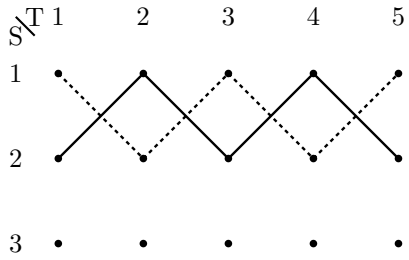
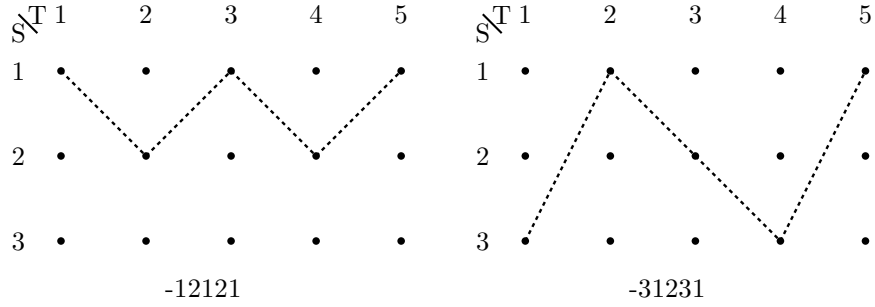
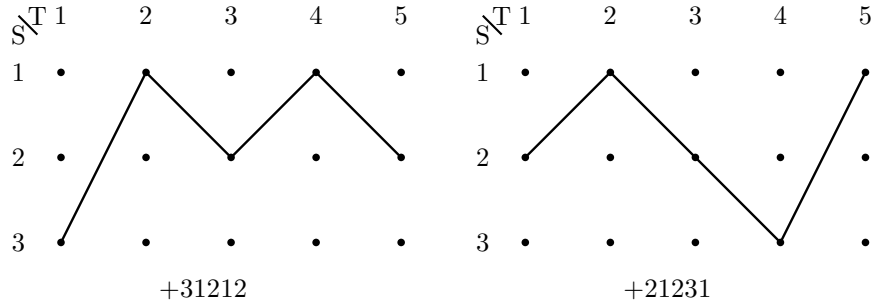
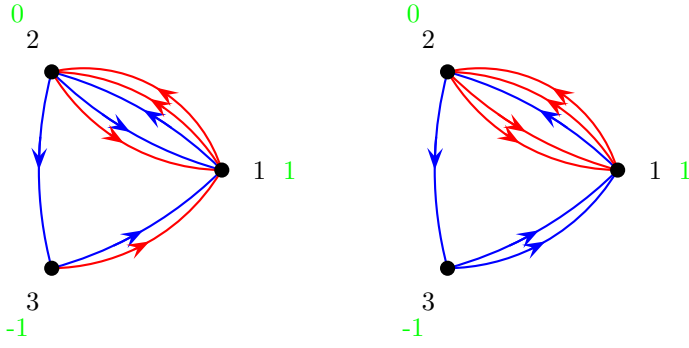


Move Graph

$$31212 \ 21213 \ 12121 \ 12131$$

$$-x_{3,1,2,1,2} * x_{2,1,2,1,3} + x_{1,2,1,2,1} * x_{1,2,1,3,1}$$

Orbit Size 2

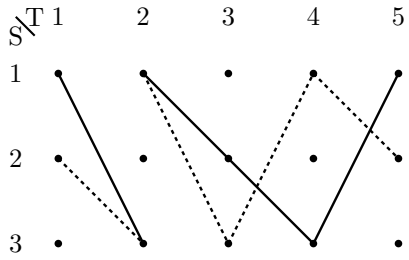
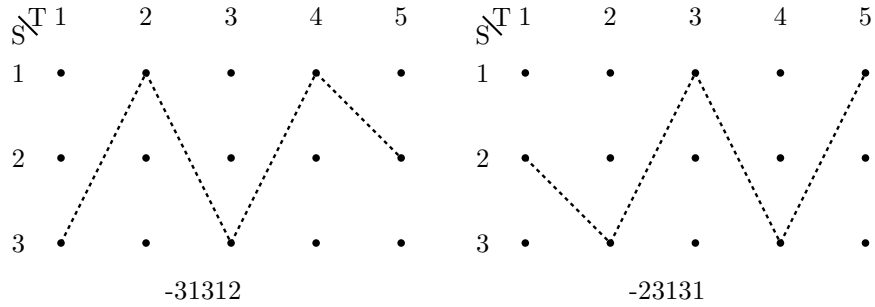
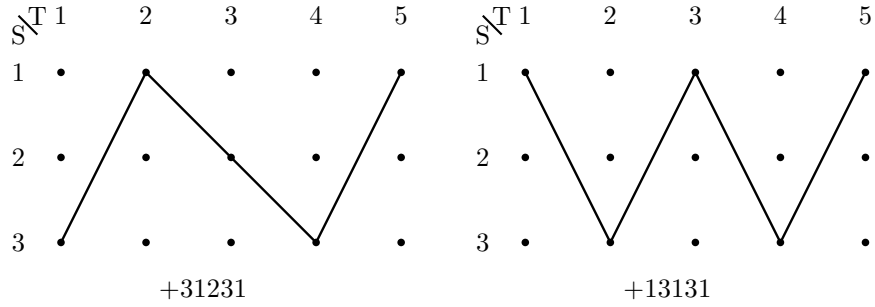
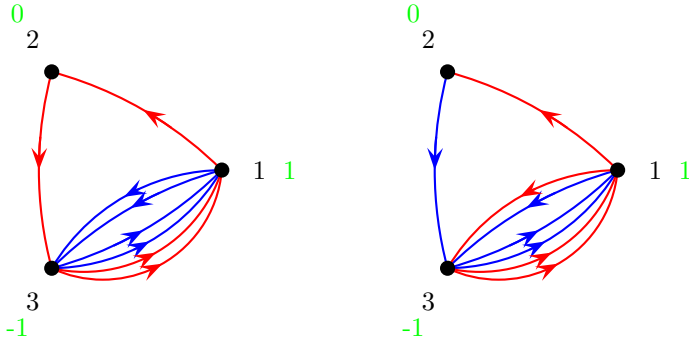


Move Graph

$$31212 \ 21231 \ 12121 \ 31231$$

$$-x_{3,1,2,1,2} * x_{2,1,2,3,1} + x_{1,2,1,2,1} * x_{3,1,2,3,1}$$

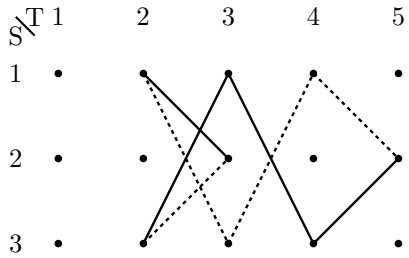
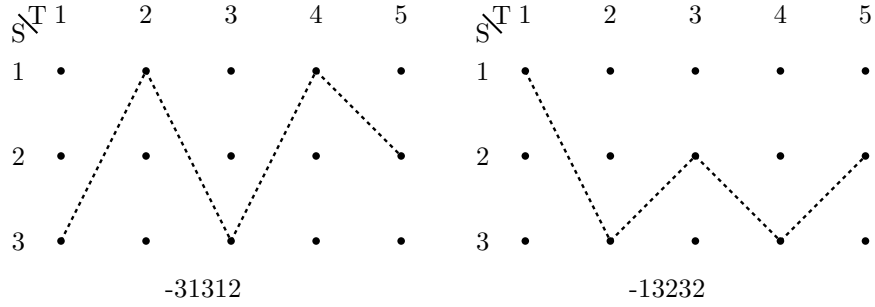
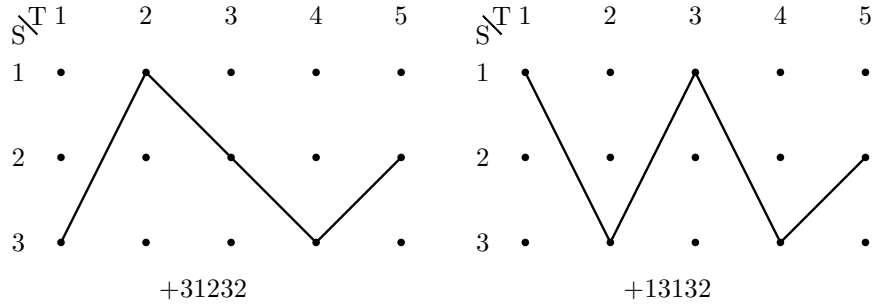
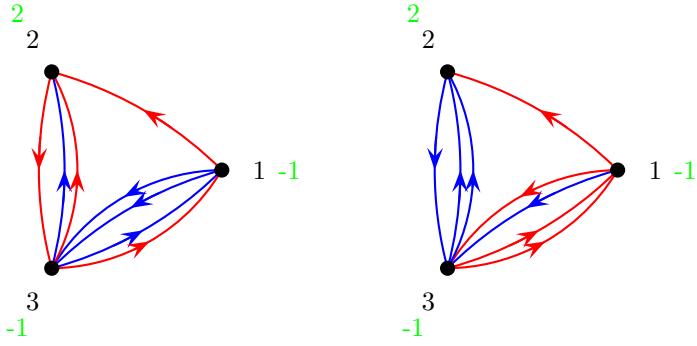
Orbit Size 2



Move Graph

$31231 \quad 13131 \quad 31312 \quad 23131$
 $-x_{3,1,2,3,1} * x_{1,3,1,3,1} + x_{3,1,3,1,2} * x_{2,3,1,3,1}$

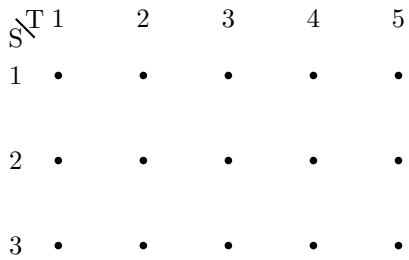
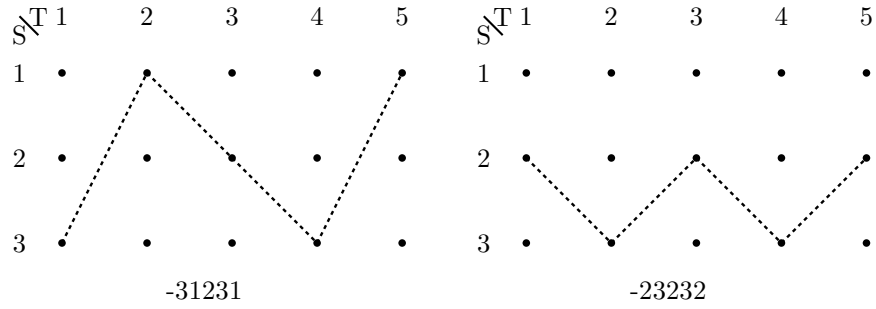
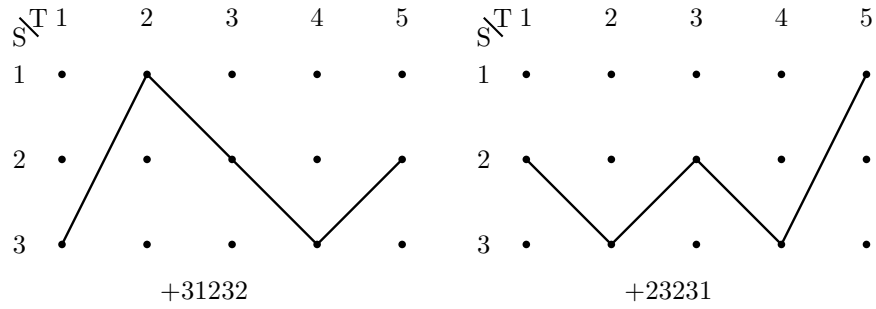
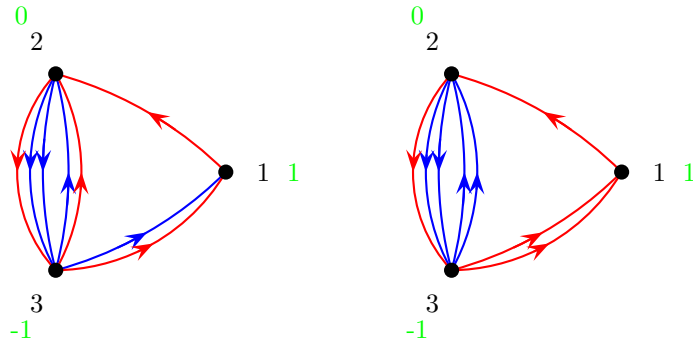
Orbit Size 2



Move Graph

31232 13132 31312 13232
 $-x_{3,1,2,3,2} * x_{1,3,1,3,2} + x_{3,1,3,1,2} * x_{1,3,2,3,2}$

Orbit Size 2

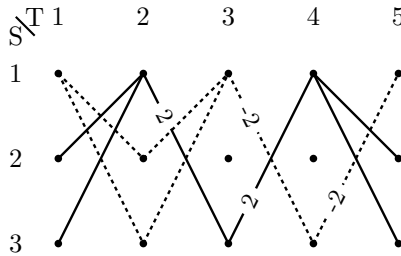
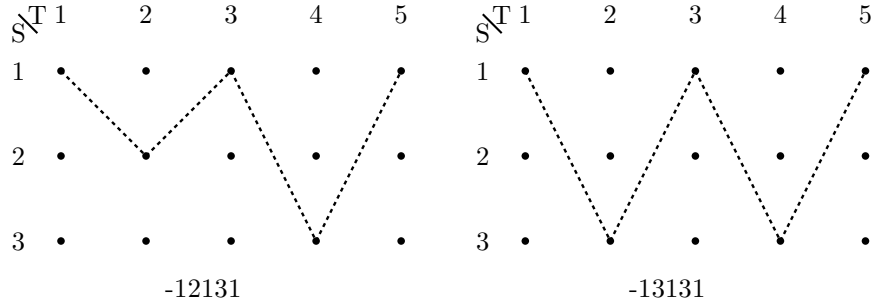
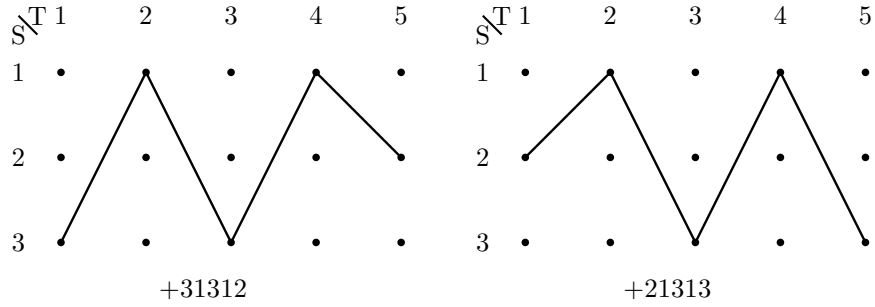
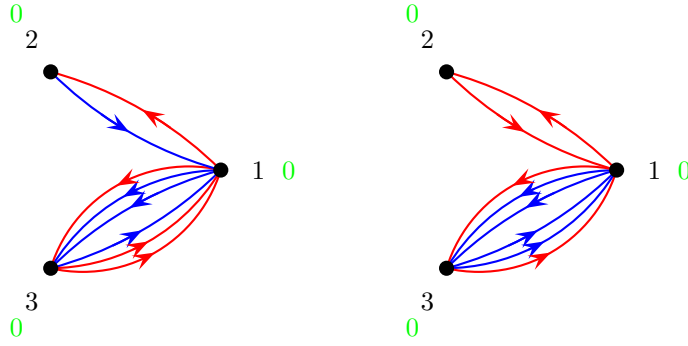


Move Graph

$$31232 \ 23231 \ 31231 \ 23232$$

$$-x_{3,1,2,3,2} * x_{2,3,2,3,1} + x_{3,1,2,3,1} * x_{2,3,2,3,2}$$

Orbit Size 2

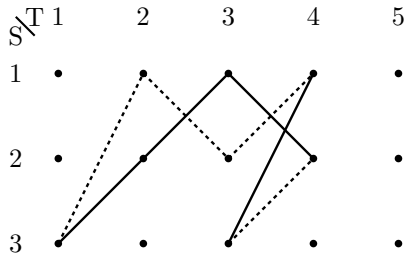
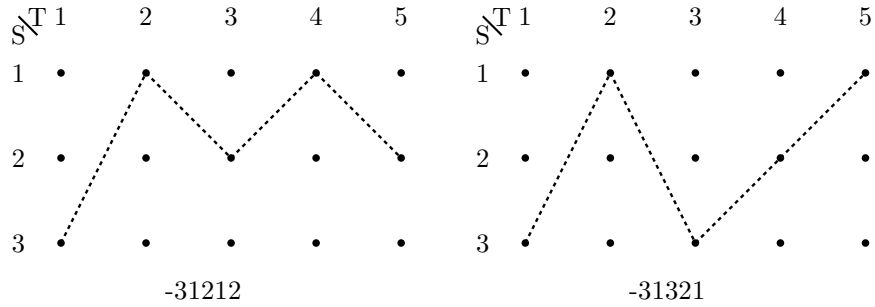
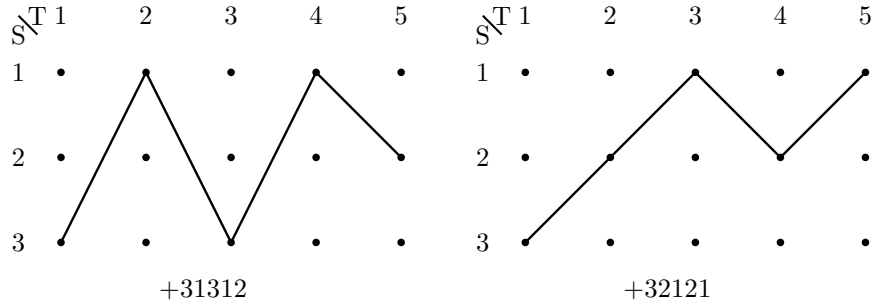
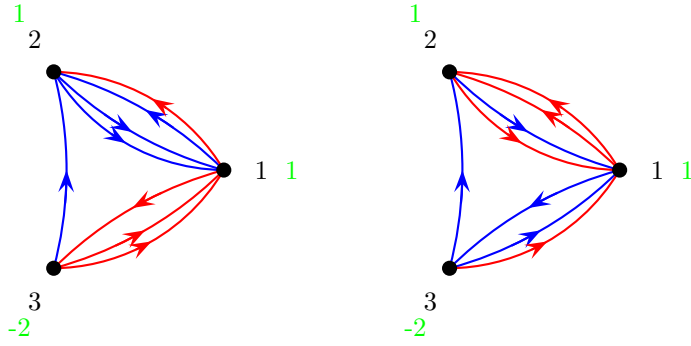


Move Graph

$$31312 \ 21313 \ 12131 \ 13131$$

$$-x_{3,1,3,1,2} * x_{2,1,3,1,3} + x_{1,2,1,3,1} * x_{1,3,1,3,1}$$

Orbit Size 2

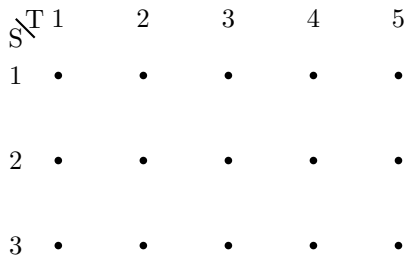
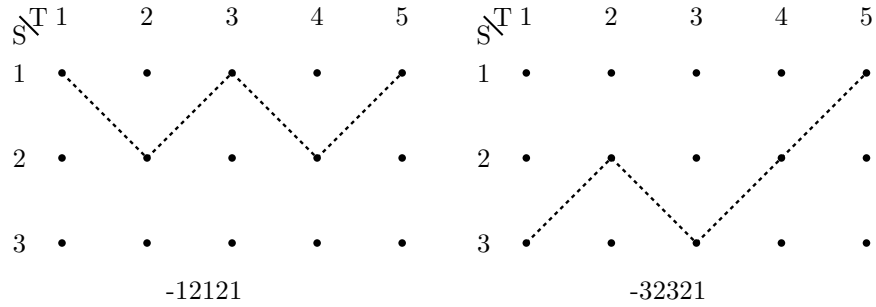
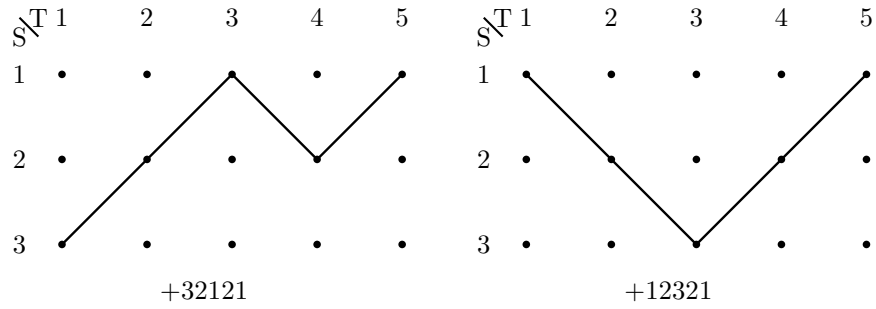
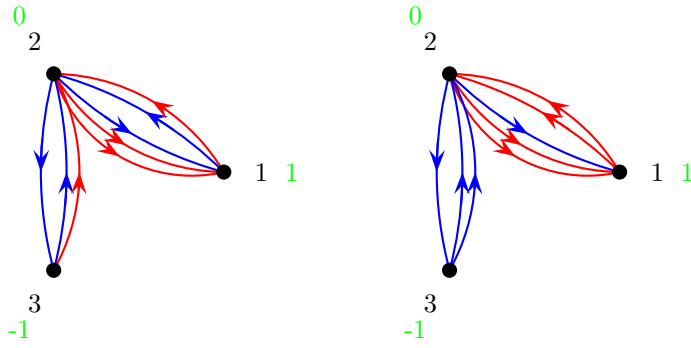


Move Graph

$$31312 \ 32121 \ 31212 \ 31321$$

$$-x_{3,1,3,1,2} * x_{3,2,1,2,1} + x_{3,1,2,1,2} * x_{3,1,3,2,1}$$

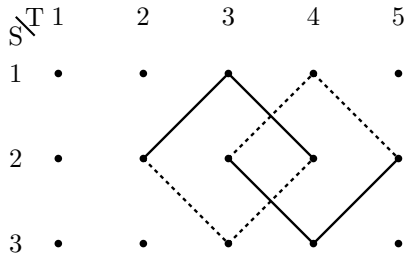
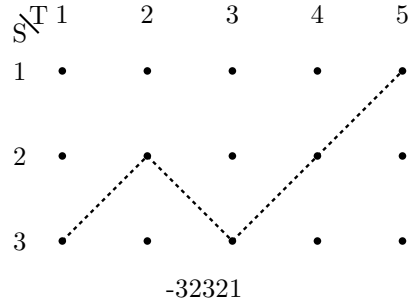
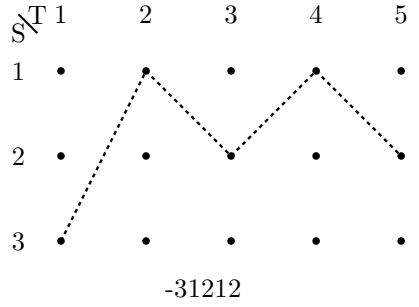
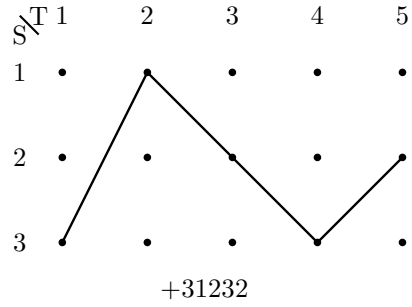
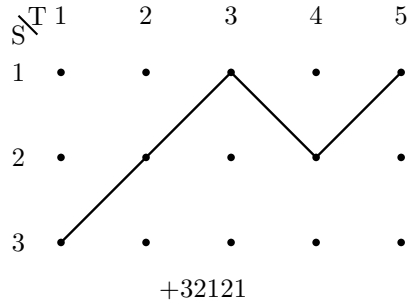
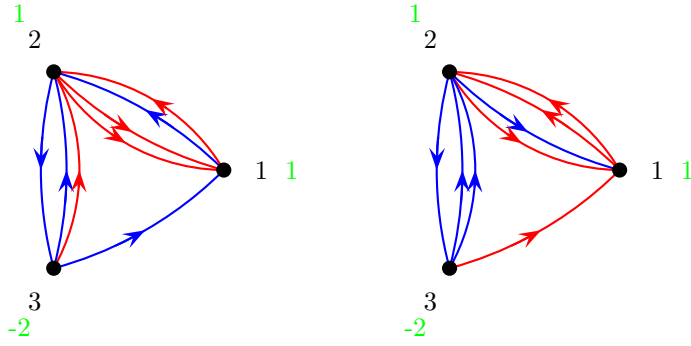
Orbit Size 2



Move Graph

$32121 \ 12321 \ 12121 \ 32321$
 $-x_{3,2,1,2,1} * x_{1,2,3,2,1} + x_{1,2,1,2,1} * x_{3,2,3,2,1}$

Orbit Size 2

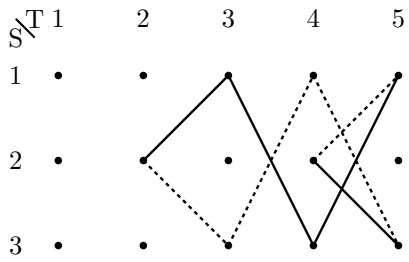
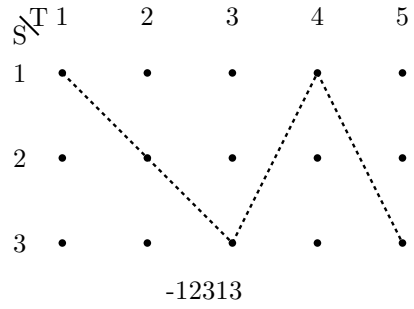
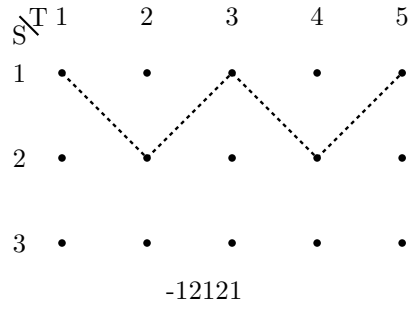
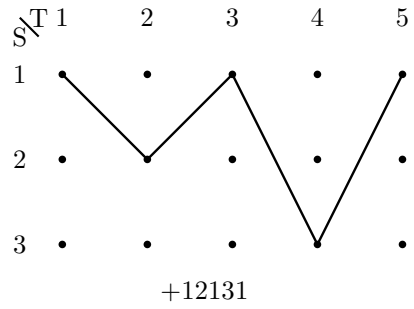
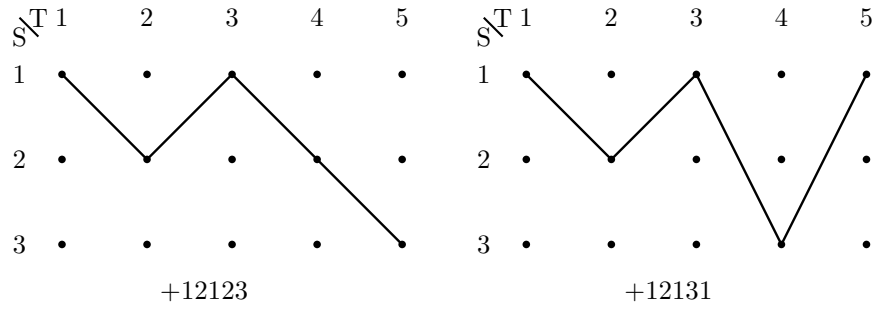
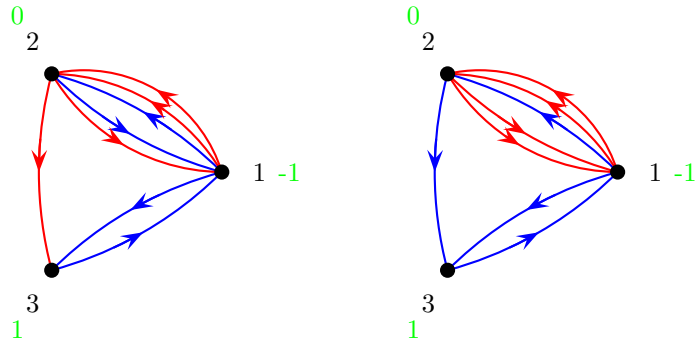


Move Graph

$$32121 \ 31232 \ 31212 \ 32321$$

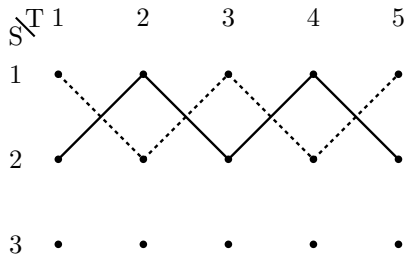
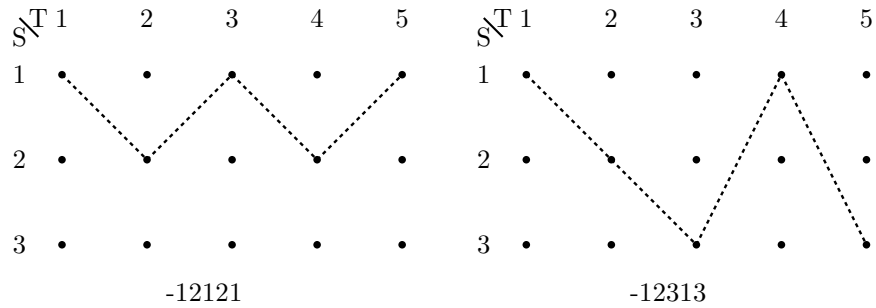
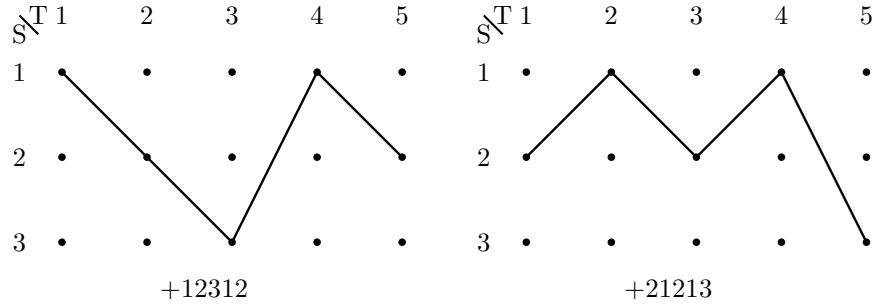
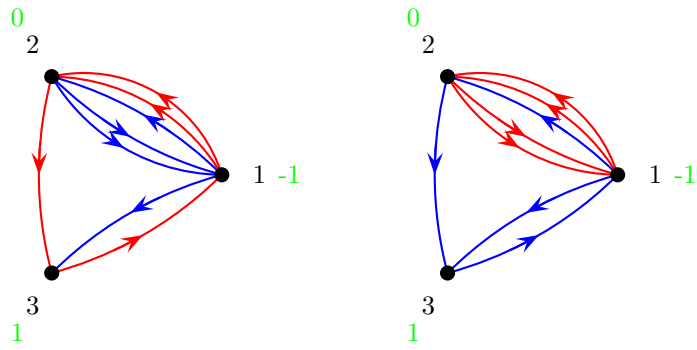
$$-x_{3,2,1,2,1} * x_{3,1,2,3,2} + x_{3,1,2,1,2} * x_{3,2,3,2,1}$$

Orbit Size 3



Move Graph

$12123 \ 12131 \ 12121 \ 12313$
 $-x_{1,2,1,2,3} * x_{1,2,1,3,1} + x_{1,2,1,2,1} * x_{1,2,3,1,3}$

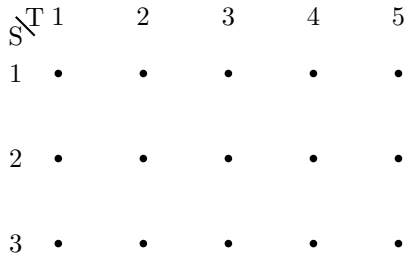
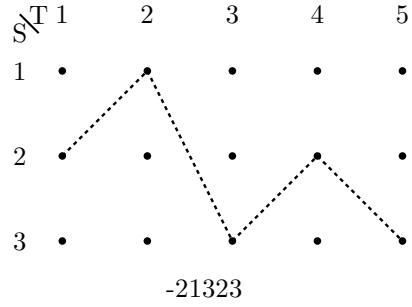
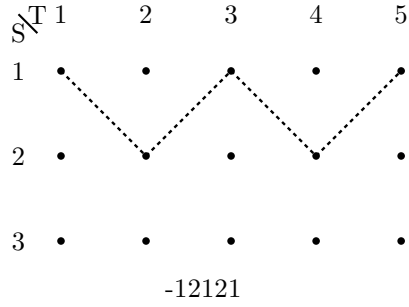
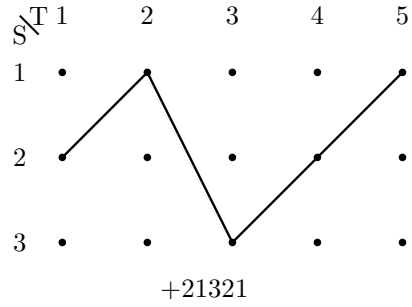
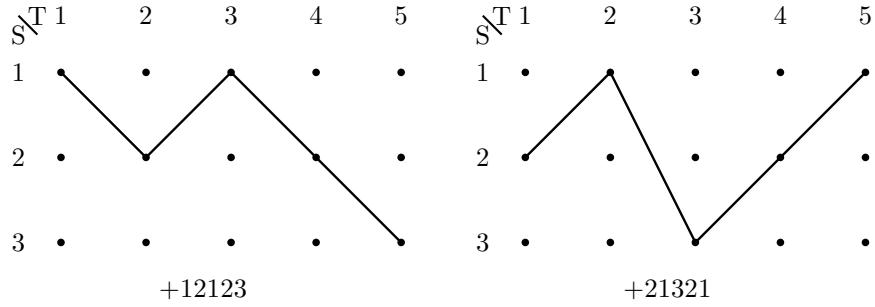
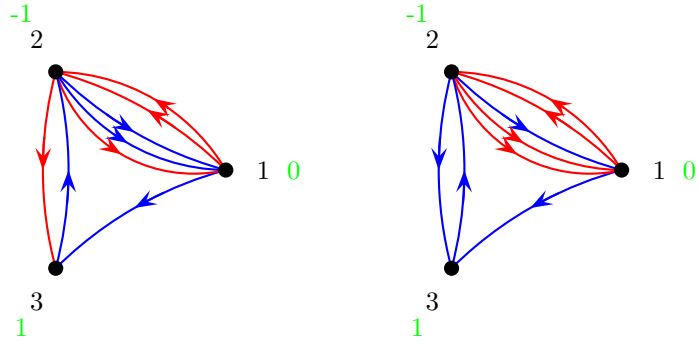


Move Graph

$$12312 \ 21213 \ 12121 \ 12313$$

$$-x_{1,2,3,1,2} * x_{2,1,2,1,3} + x_{1,2,1,2,1} * x_{1,2,3,1,3}$$

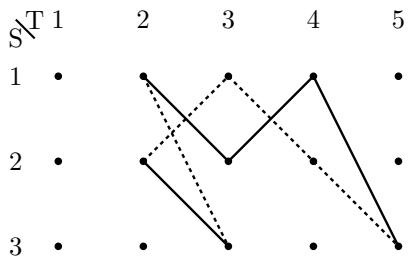
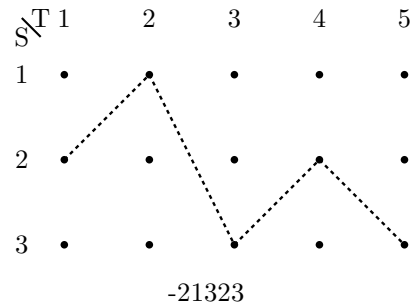
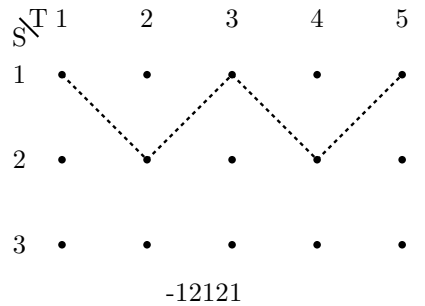
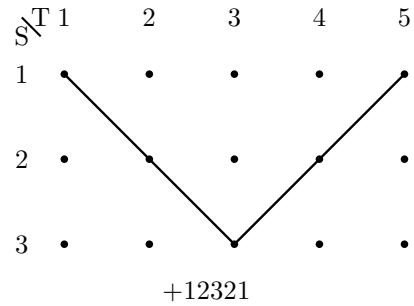
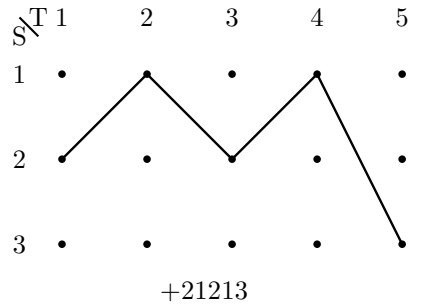
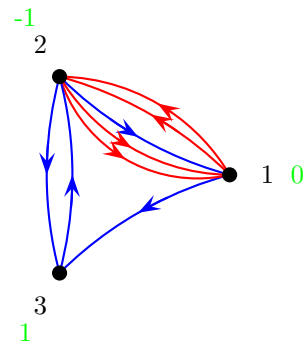
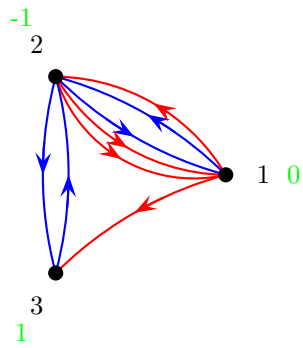
Orbit Size 3



Move Graph

$$12123 \ 21321 \ 12121 \ 21323$$

$$-x_{1,2,1,2,3} * x_{2,1,3,2,1} + x_{1,2,1,2,1} * x_{2,1,3,2,3}$$

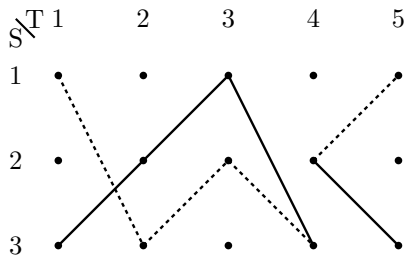
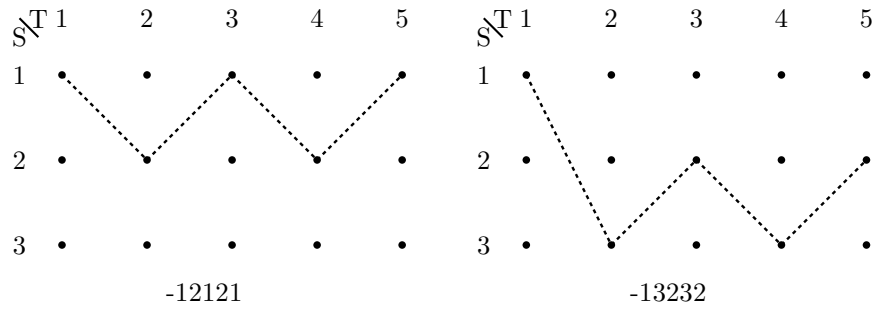
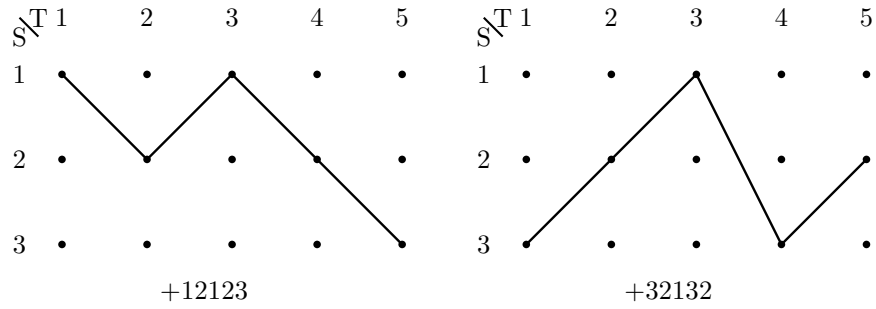
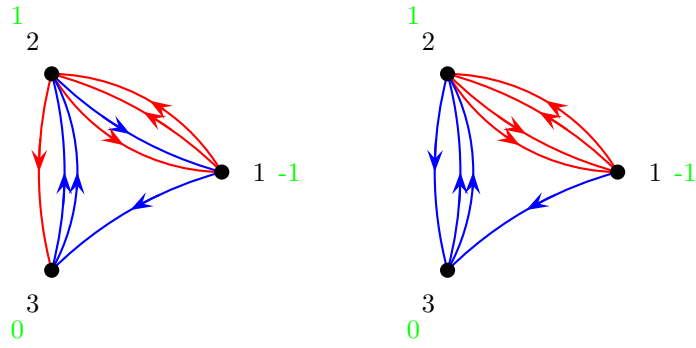


Move Graph

21213 12321 12121 21323

$$-x_{2,1,2,1,3} * x_{1,2,3,2,1} + x_{1,2,1,2,1} * x_{2,1,3,2,3}$$

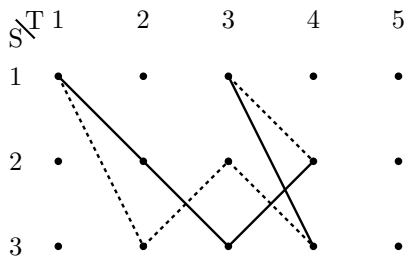
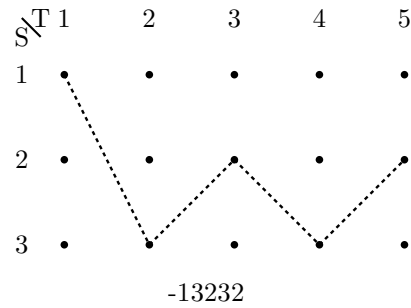
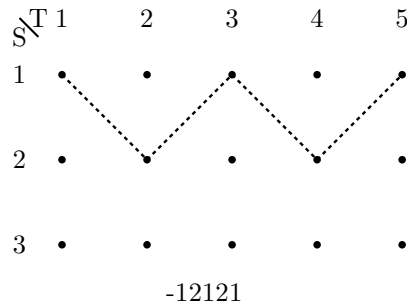
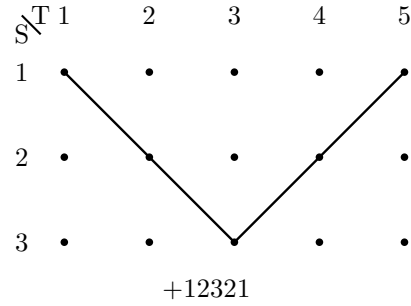
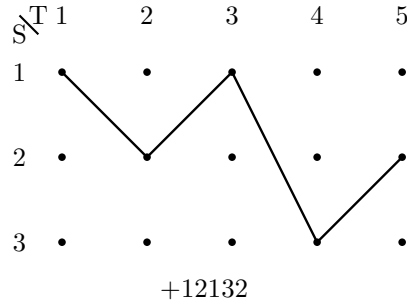
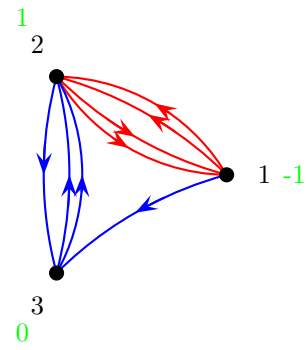
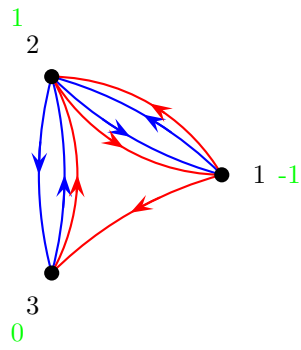
Orbit Size 3



Move Graph

$$12123 \ 32132 \ 12121 \ 13232$$

$$-x_{1,2,1,2,3} * x_{3,2,1,3,2} + x_{1,2,1,2,1} * x_{1,3,2,3,2}$$

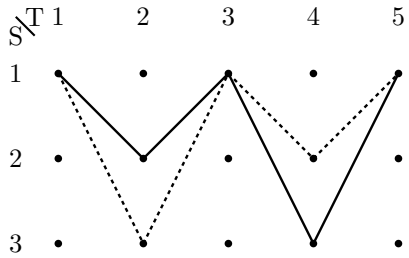
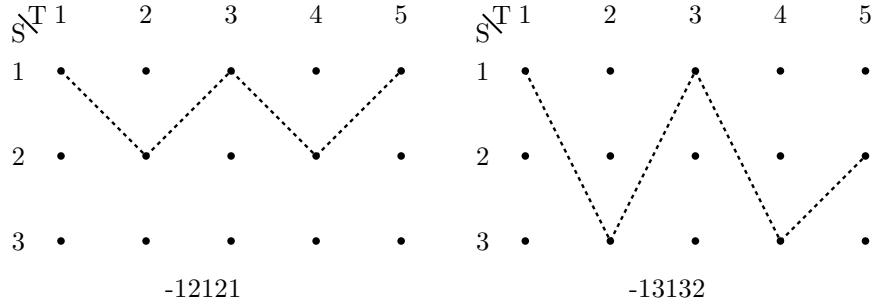
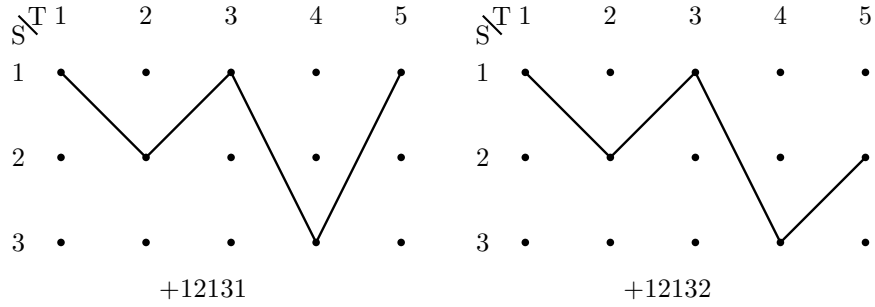
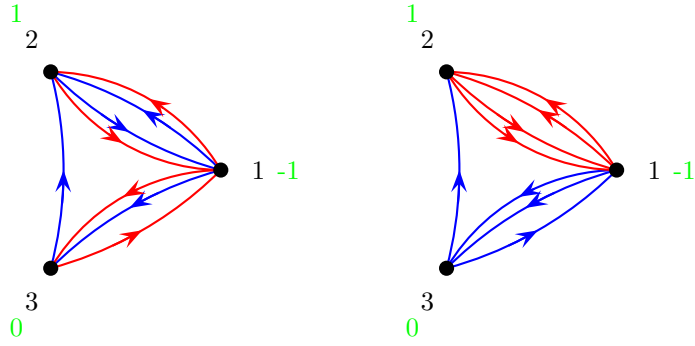


Move Graph

$$12132 \ 12321 \ 12121 \ 13232$$

$$-x_{1,2,1,3,2} * x_{1,2,3,2,1} + x_{1,2,1,2,1} * x_{1,3,2,3,2}$$

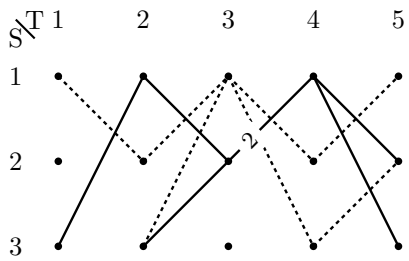
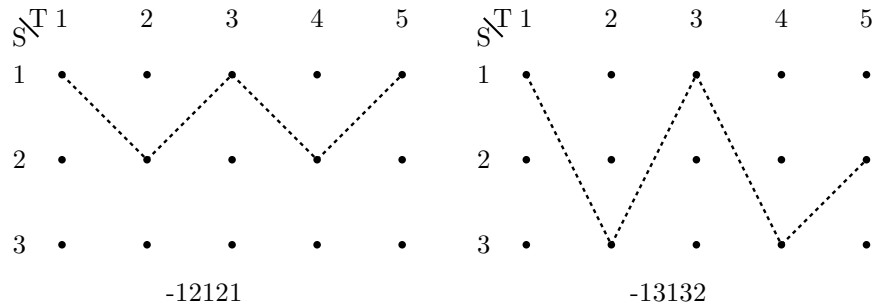
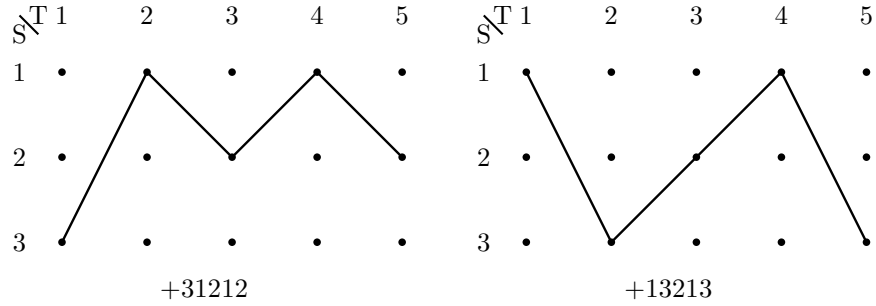
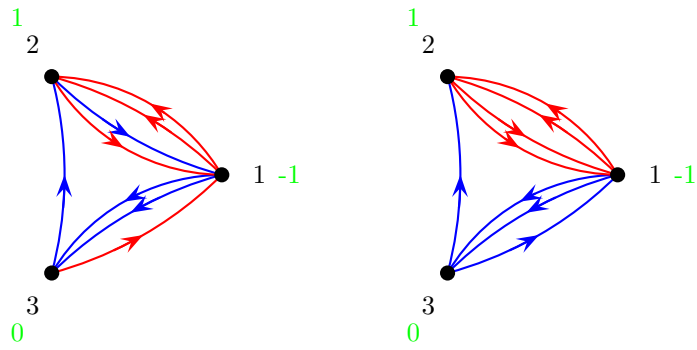
Orbit Size 3



Move Graph

12131 12132 12121 13132

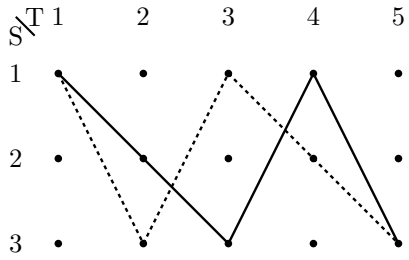
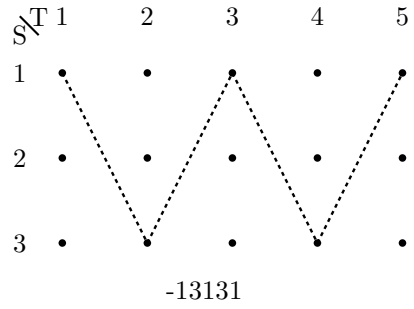
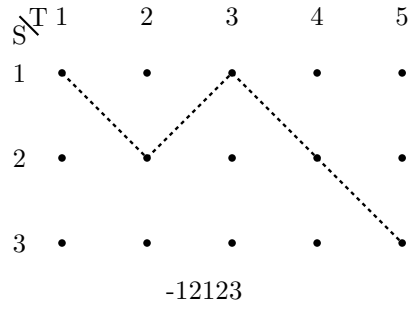
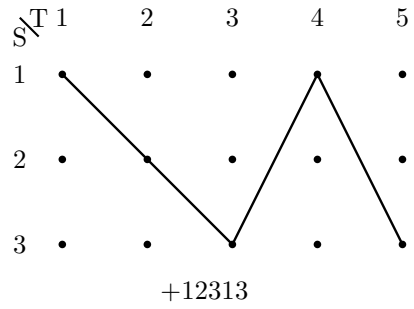
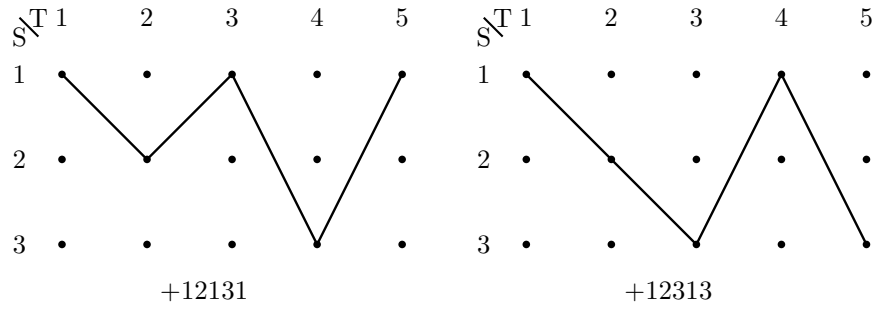
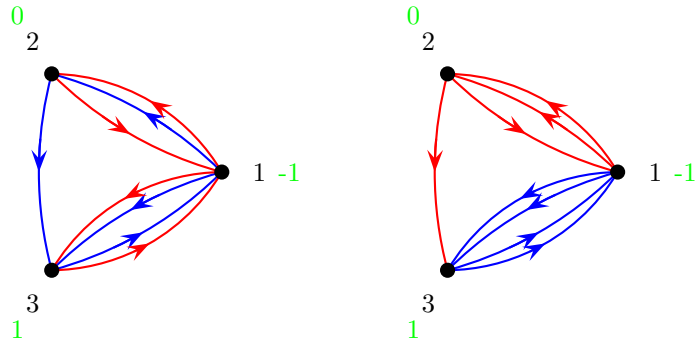
$$-x_{1,2,1,3,1} * x_{1,2,1,3,2} + x_{1,2,1,2,1} * x_{1,3,1,3,2}$$



Move Graph

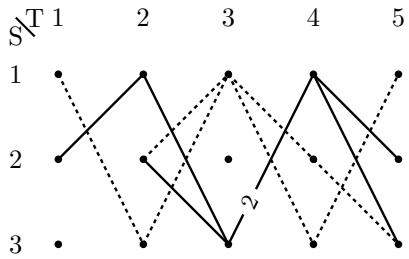
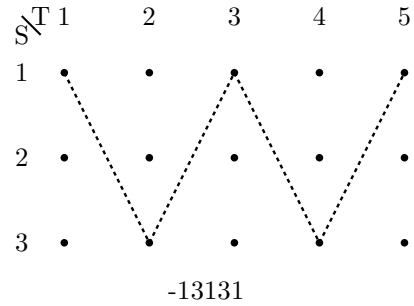
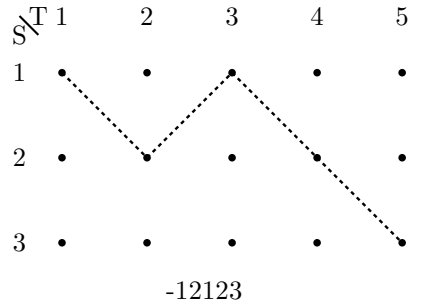
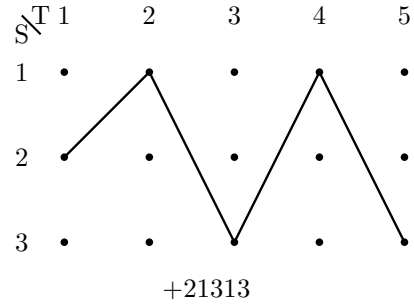
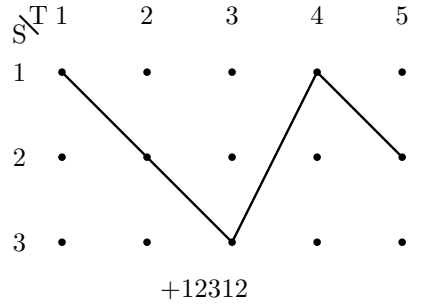
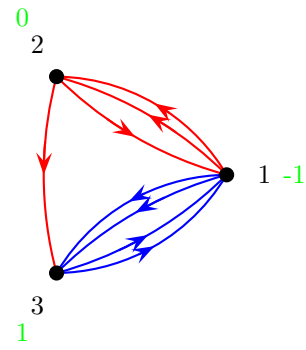
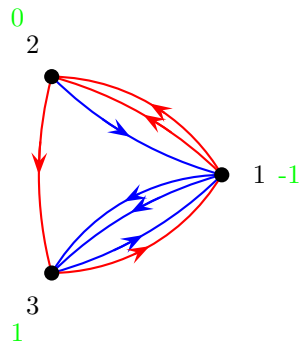
$31212 \quad 13213 \quad 12121 \quad 13132$
 $-x_{3,1,2,1,2} * x_{1,3,2,1,3} + x_{1,2,1,2,1} * x_{1,3,1,3,2}$

Orbit Size 3



Move Graph

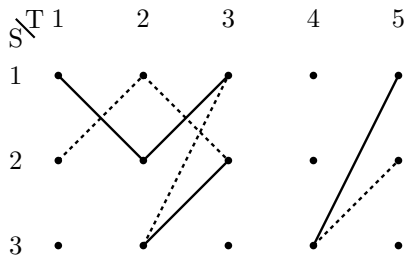
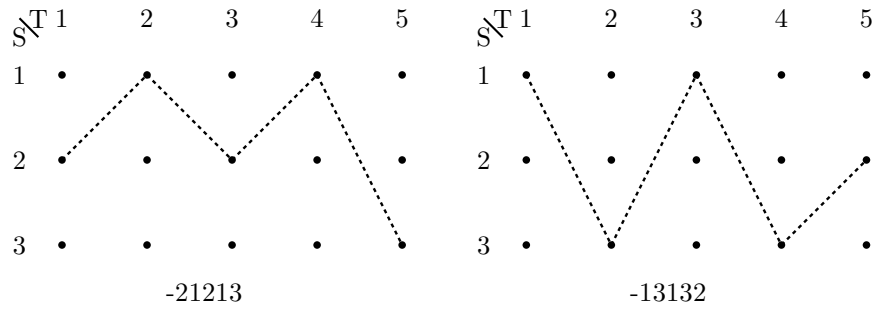
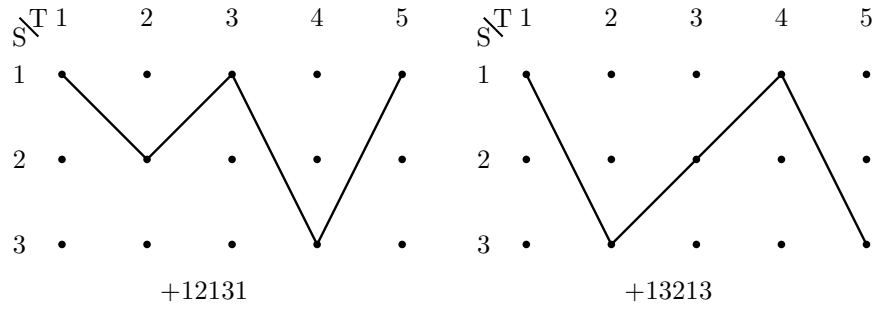
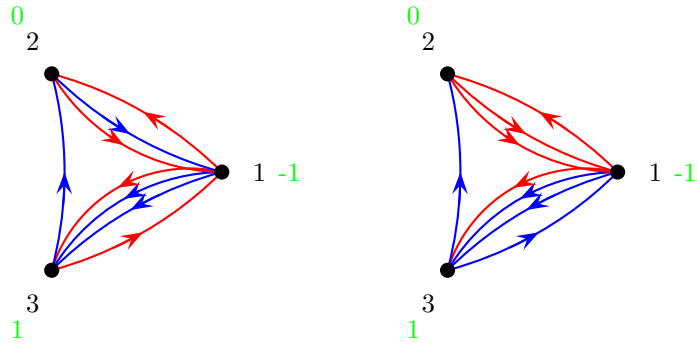
$12131 \ 12313 \ 12123 \ 13131$
 $-x_{1,2,1,3,1} * x_{1,2,3,1,3} + x_{1,2,1,2,3} * x_{1,3,1,3,1}$



Move Graph

12312 21313 12123 13131
 $-x_{1,2,3,1,2} * x_{2,1,3,1,3} + x_{1,2,1,2,3} * x_{1,3,1,3,1}$

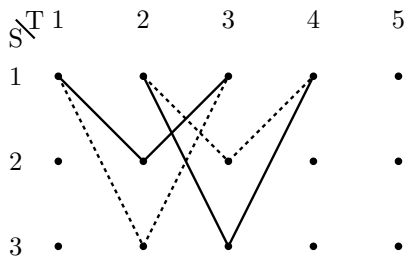
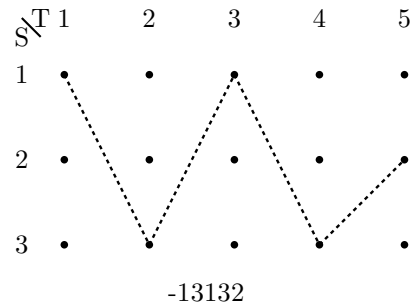
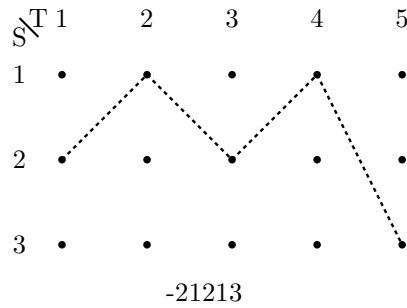
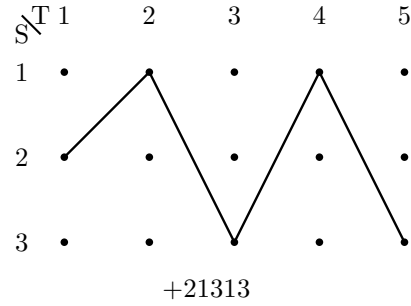
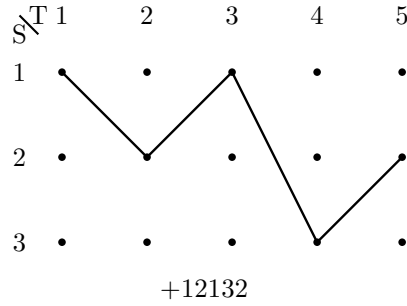
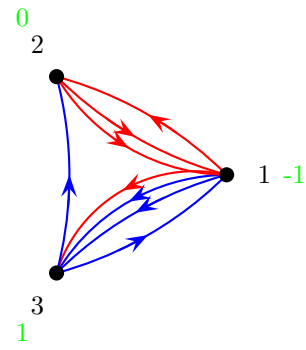
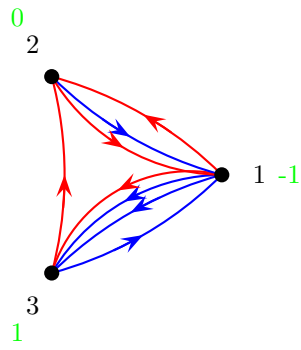
Orbit Size 3



Move Graph

$$12131 \ 13213 \ 21213 \ 13132$$

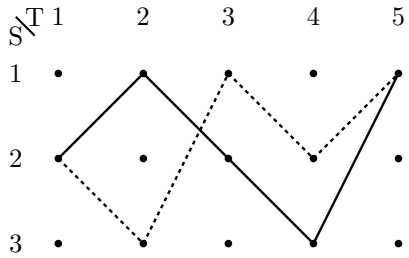
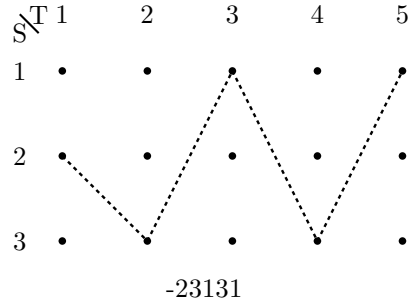
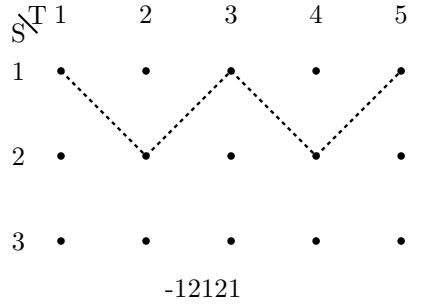
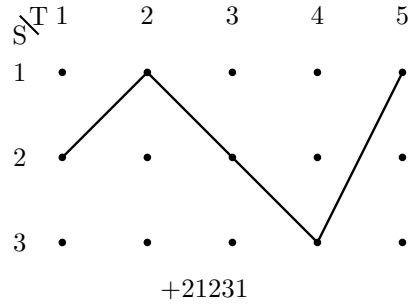
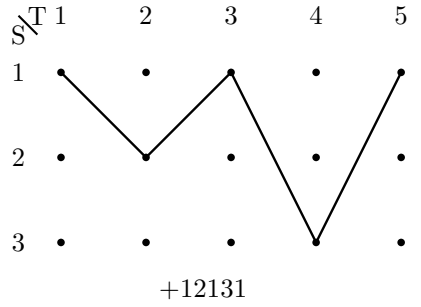
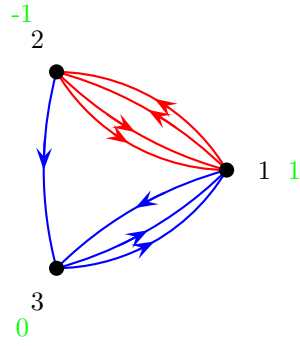
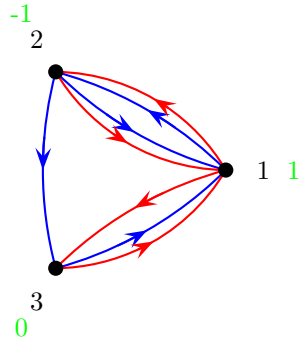
$$-x_{1,2,1,3,1} * x_{1,3,2,1,3} + x_{2,1,2,1,3} * x_{1,3,1,3,2}$$



Move Graph

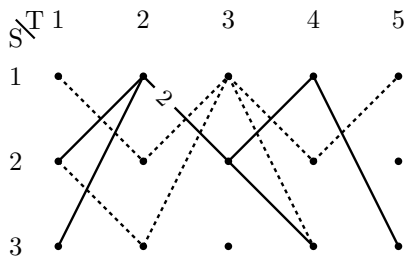
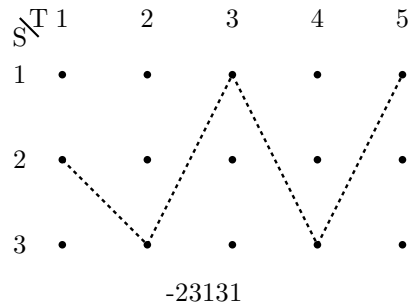
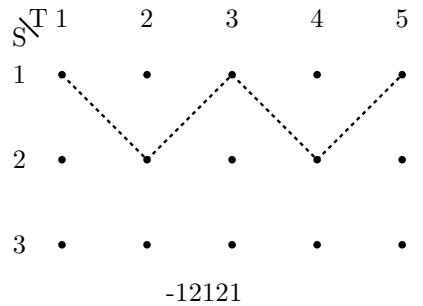
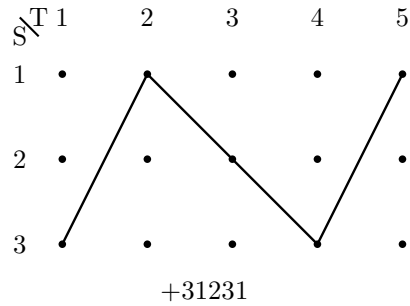
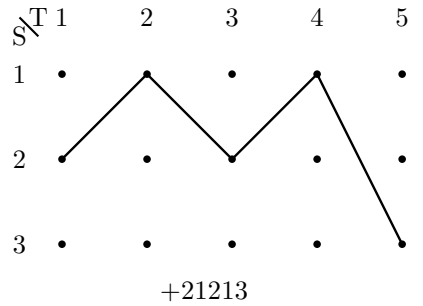
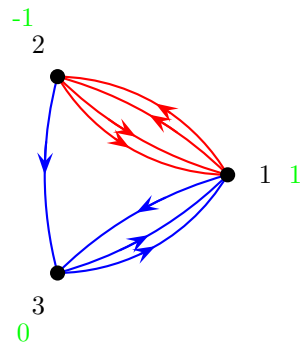
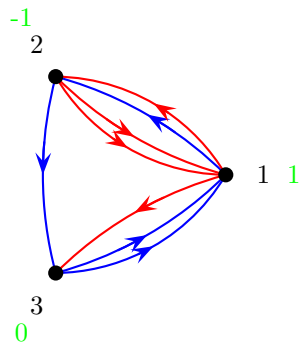
12132 21313 21213 13132
 $-x_{1,2,1,3,2} * x_{2,1,3,1,3} + x_{2,1,2,1,3} * x_{1,3,1,3,2}$

Orbit Size 3



Move Graph

12131 21231 12121 23131
 $-x_{1,2,1,3,1} * x_{2,1,2,3,1} + x_{1,2,1,2,1} * x_{2,3,1,3,1}$

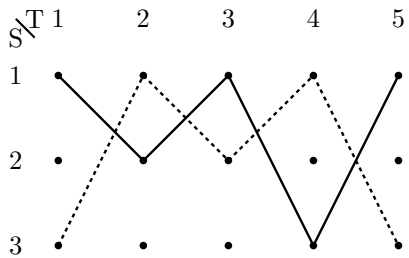
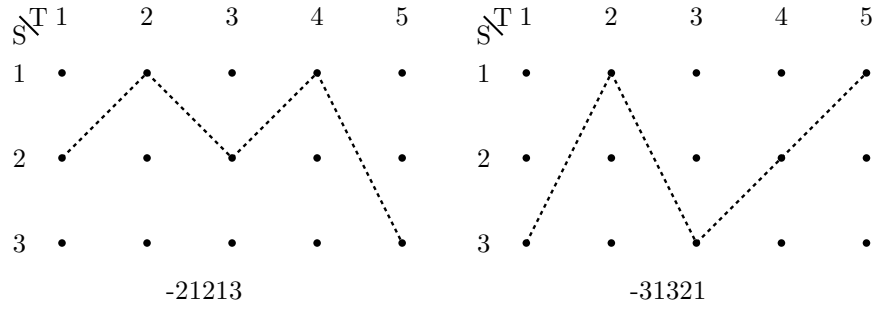
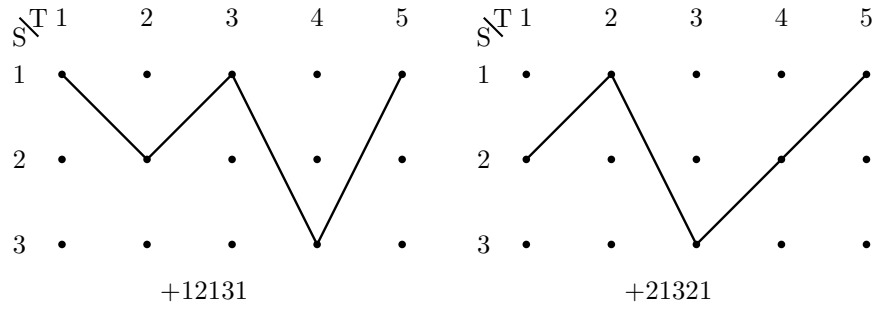
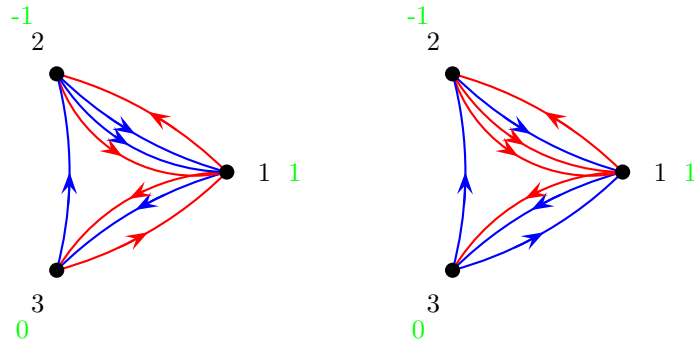


Move Graph

$$21213 \ 31231 \ 12121 \ 23131$$

$$-x_{2,1,2,1,3} * x_{3,1,2,3,1} + x_{1,2,1,2,1} * x_{2,3,1,3,1}$$

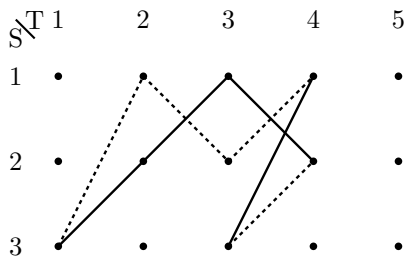
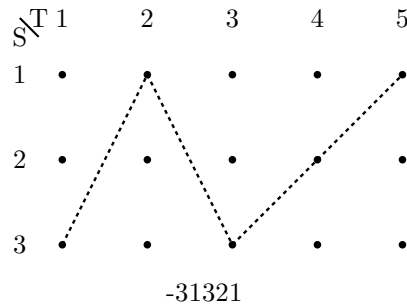
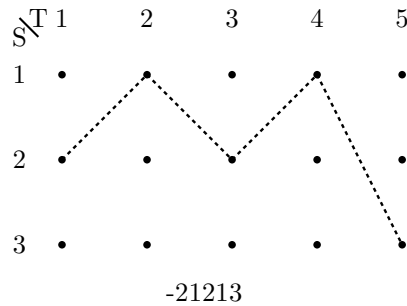
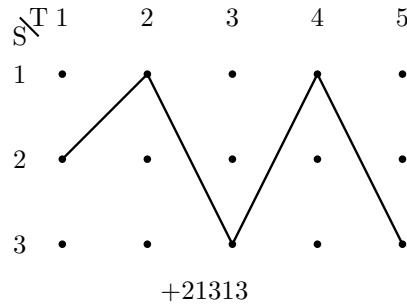
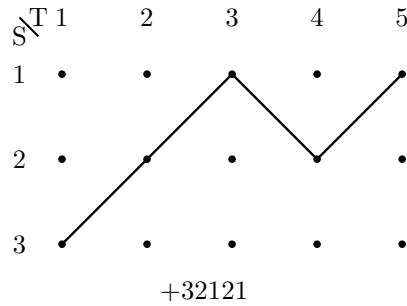
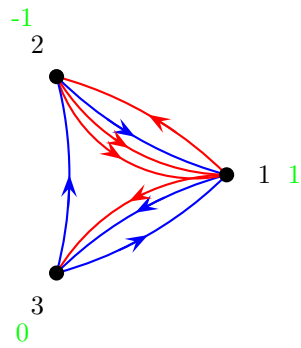
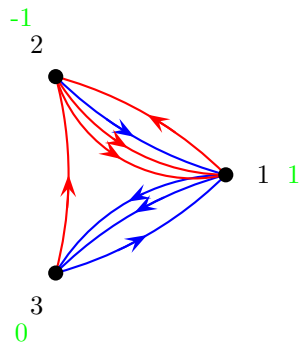
Orbit Size 3



Move Graph

$$12131 \ 21321 \ 21213 \ 31321$$

$$-x_{1,2,1,3,1} * x_{2,1,3,2,1} + x_{2,1,2,1,3} * x_{3,1,3,2,1}$$

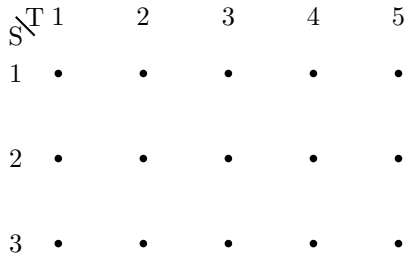
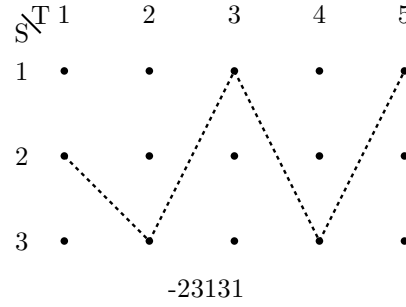
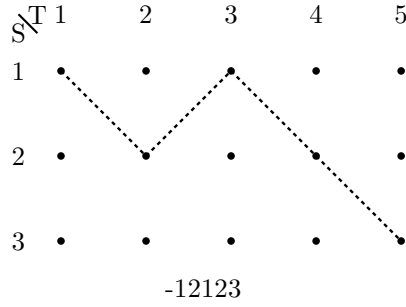
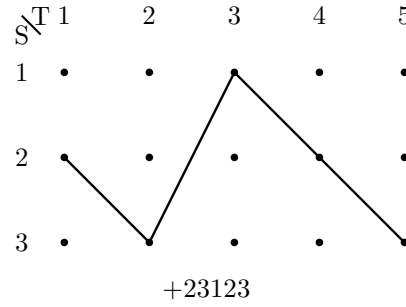
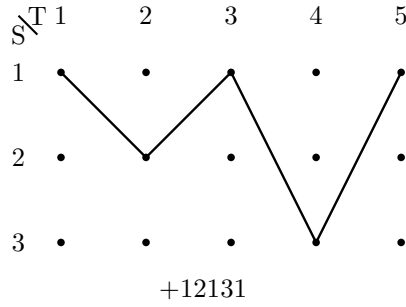
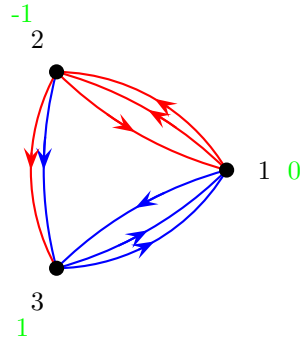
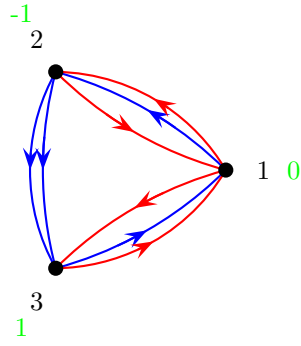


Move Graph

$$32121 \ 21313 \ 21213 \ 31321$$

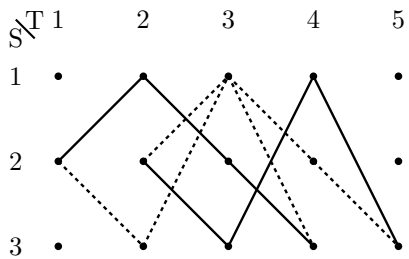
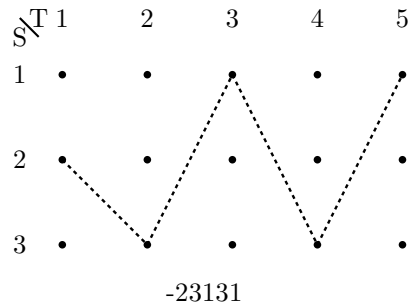
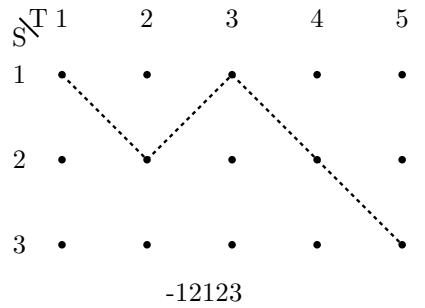
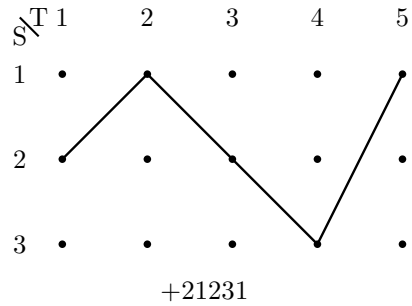
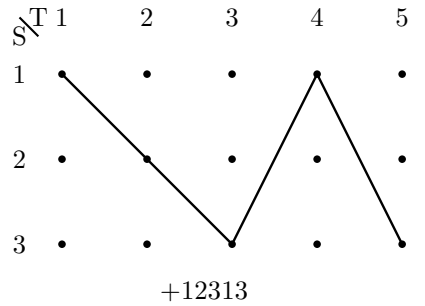
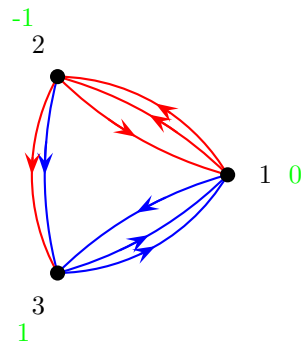
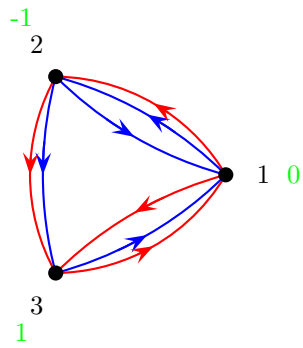
$$-x_{3,2,1,2,1} * x_{2,1,3,1,3} + x_{2,1,2,1,3} * x_{3,1,3,2,1}$$

Orbit Size 3



Move Graph

$12131 \ 23123 \ 12123 \ 23131$
 $-x_{1,2,1,3,1} * x_{2,3,1,2,3} + x_{1,2,1,2,3} * x_{2,3,1,3,1}$

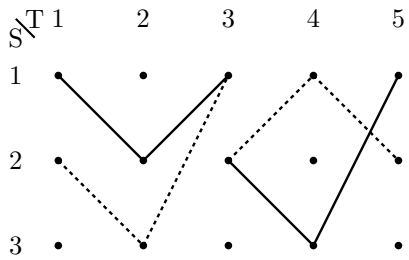
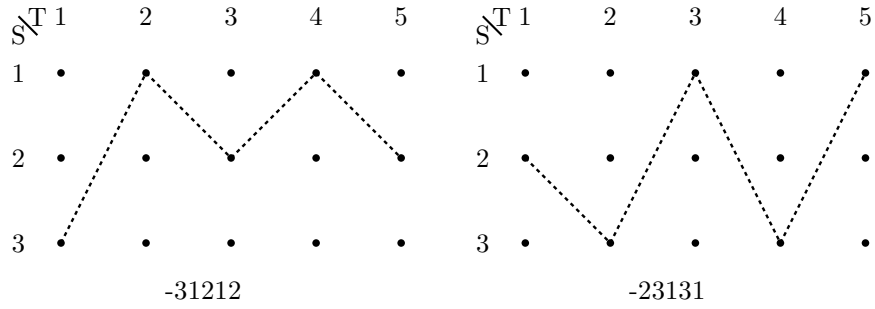
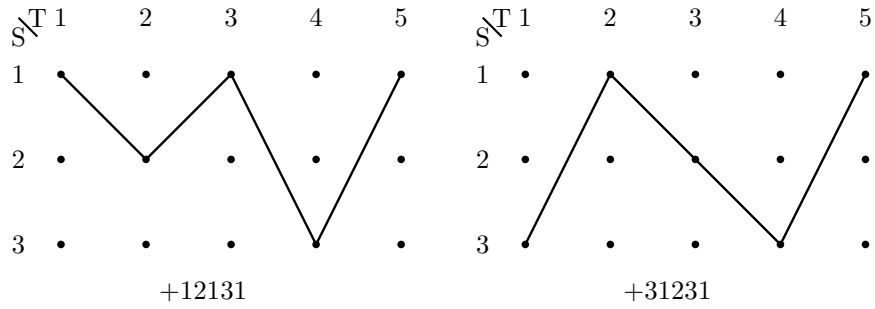
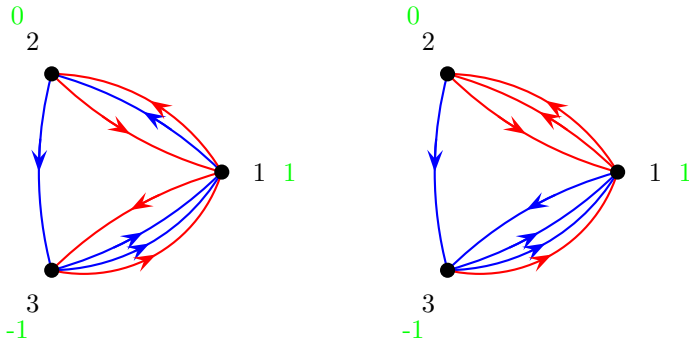


Move Graph

$$12313 \ 21231 \ 12123 \ 23131$$

$$-x_{1,2,3,1,3} * x_{2,1,2,3,1} + x_{1,2,1,2,3} * x_{2,3,1,3,1}$$

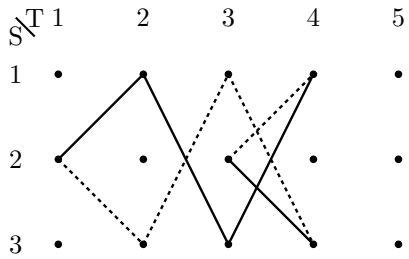
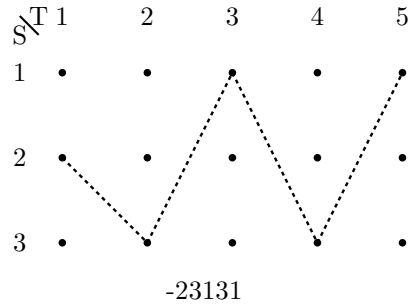
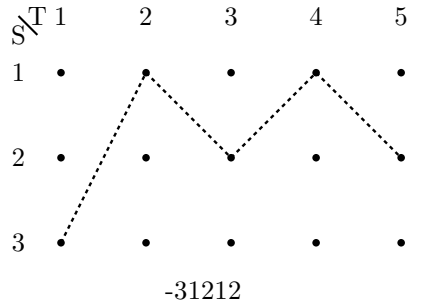
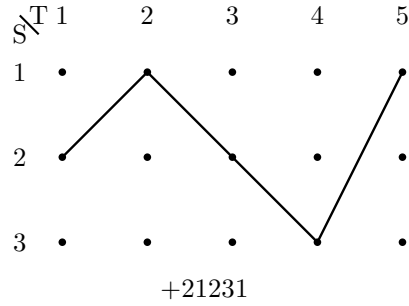
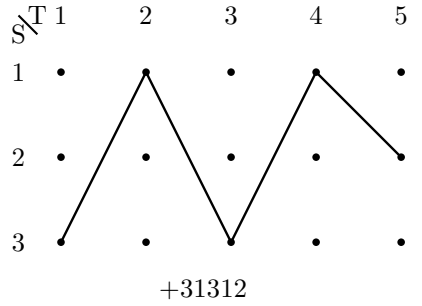
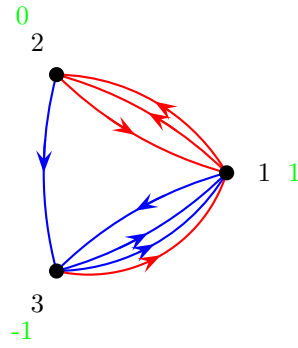
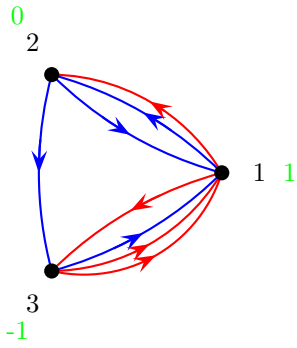
Orbit Size 3



Move Graph

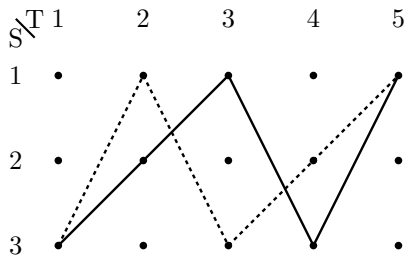
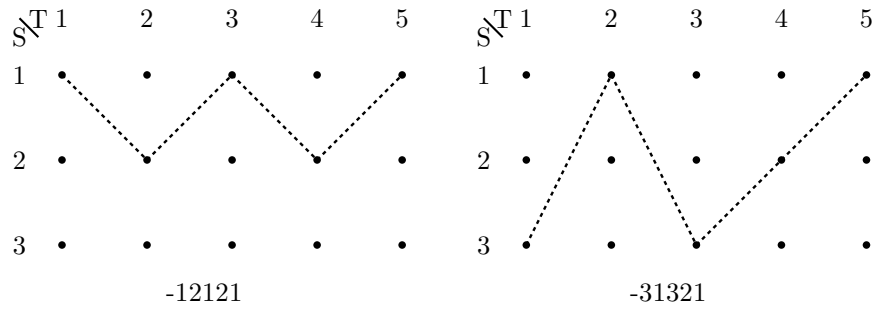
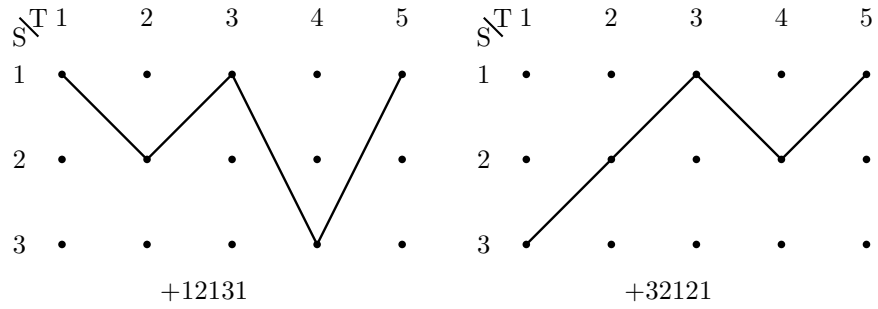
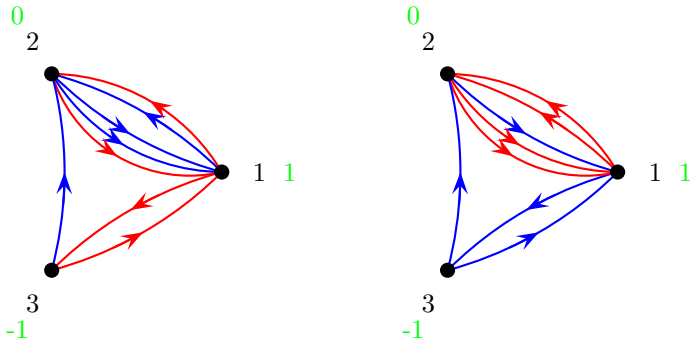
$$12131 \ 31231 \ 31212 \ 23131$$

$$-x_{1,2,1,3,1} * x_{3,1,2,3,1} + x_{3,1,2,1,2} * x_{2,3,1,3,1}$$



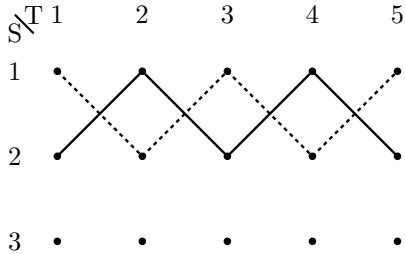
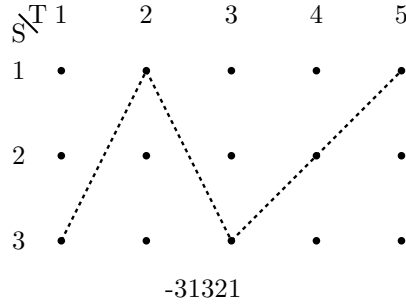
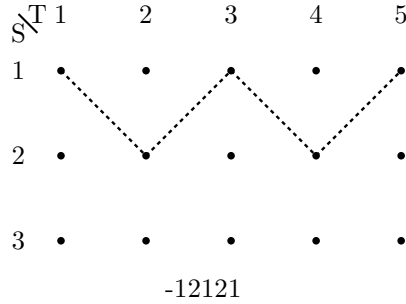
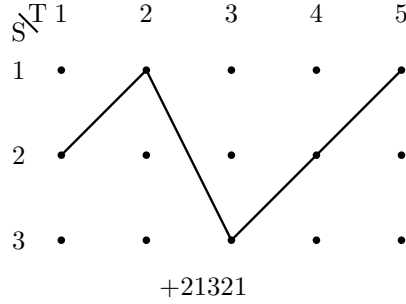
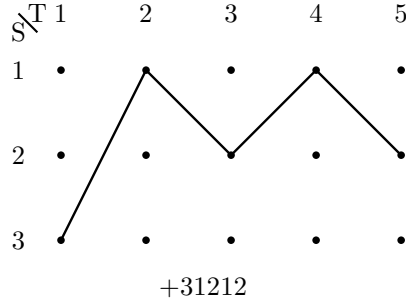
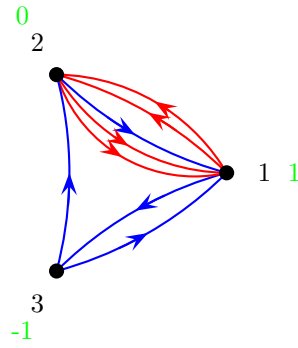
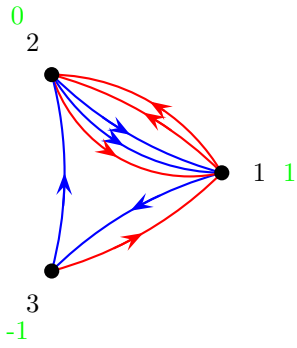
31312 21231 31212 23131
 $-x_{3,1,3,1,2} * x_{2,1,2,3,1} + x_{3,1,2,1,2} * x_{2,3,1,3,1}$

Orbit Size 3



Move Graph

$12131 \ 32121 \ 12121 \ 31321$
 $-x_{1,2,1,3,1} * x_{3,2,1,2,1} + x_{1,2,1,2,1} * x_{3,1,3,2,1}$

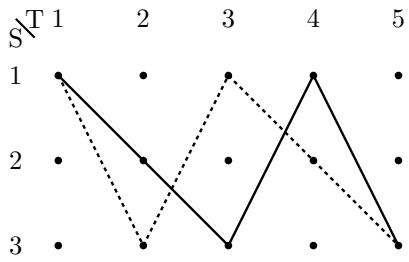
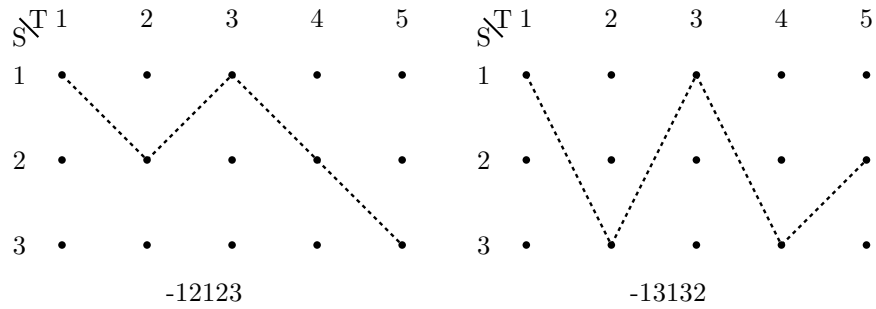
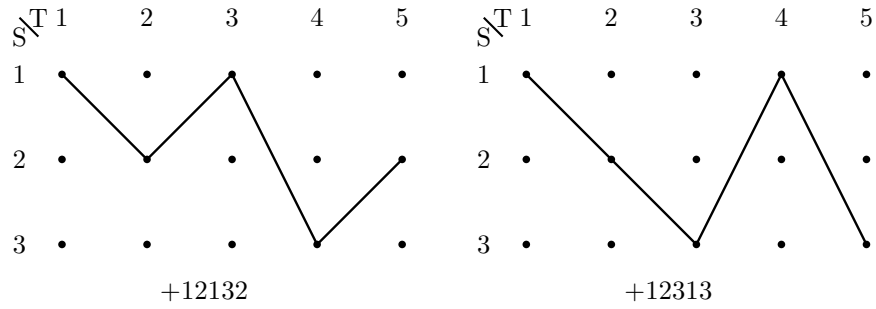
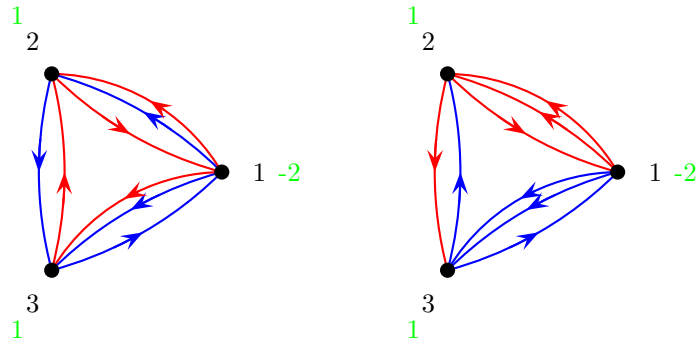


Move Graph

31212 21321 12121 31321

$$-x_{3,1,2,1,2} * x_{2,1,3,2,1} + x_{1,2,1,2,1} * x_{3,1,3,2,1}$$

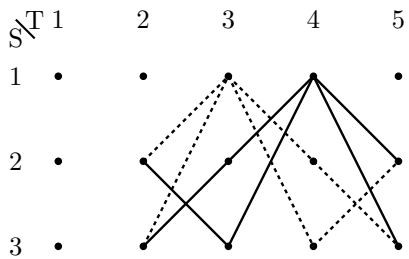
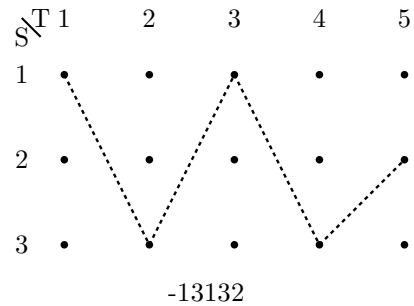
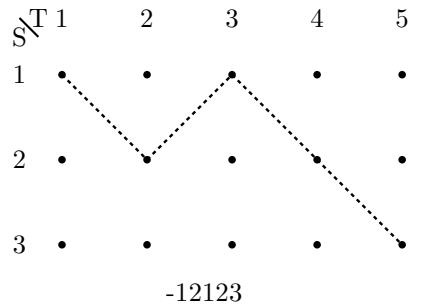
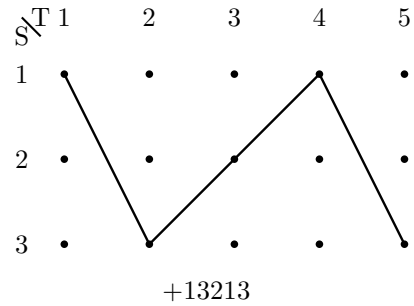
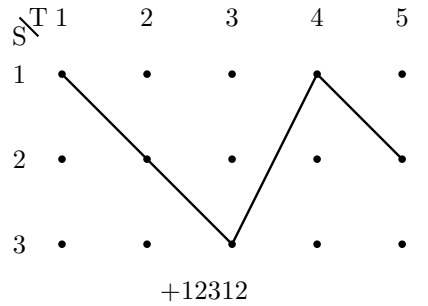
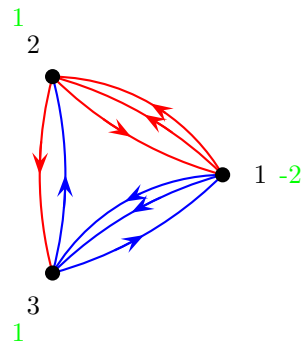
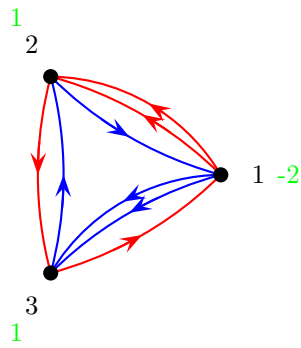
Orbit Size 3



Move Graph

$$12132 \ 12313 \ 12123 \ 13132$$

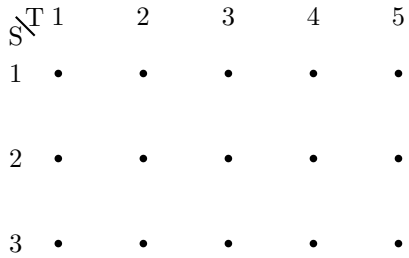
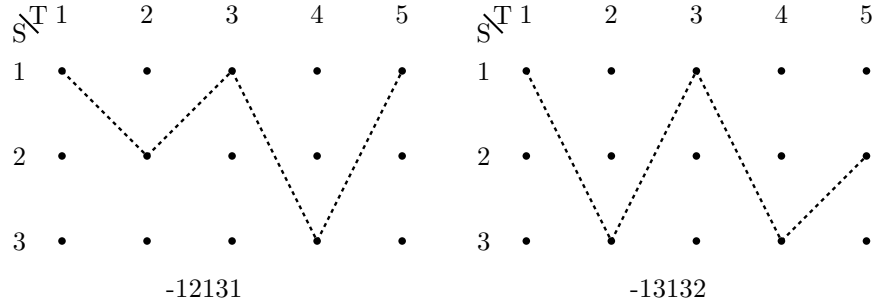
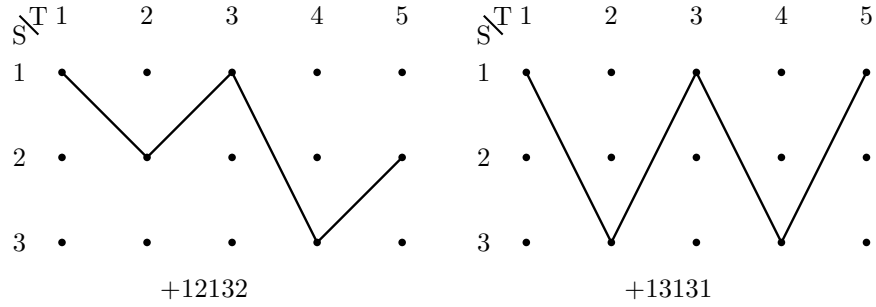
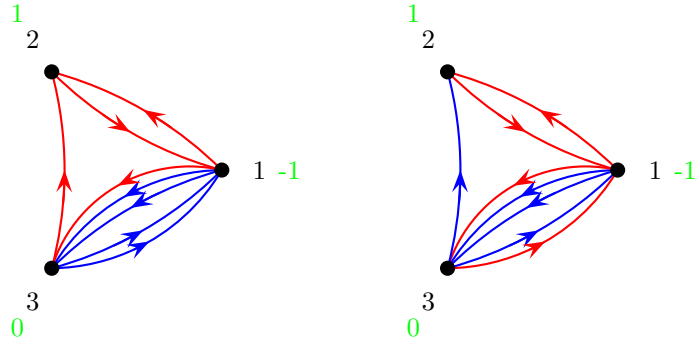
$$-x_{1,2,1,3,2} * x_{1,2,3,1,3} + x_{1,2,1,2,3} * x_{1,3,1,3,2}$$



Move Graph

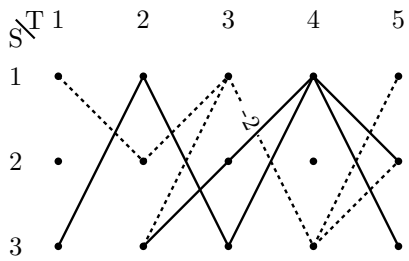
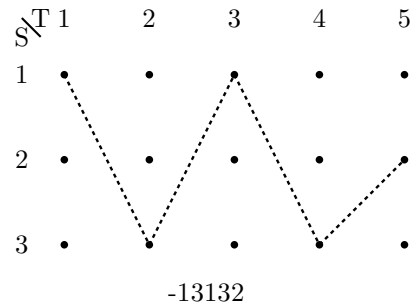
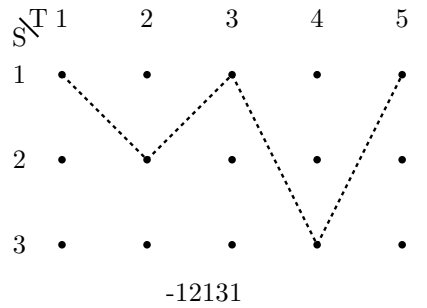
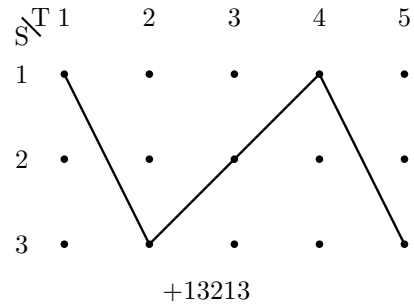
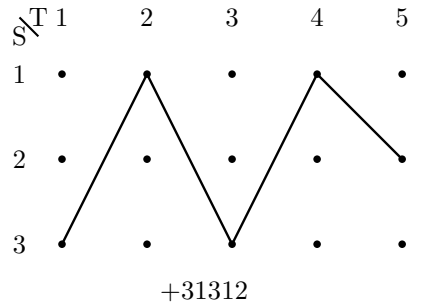
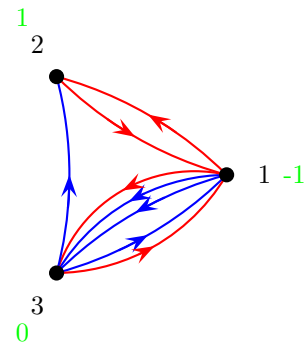
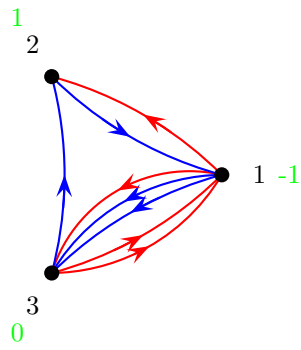
12312 13213 12123 13132
 $-x_{1,2,3,1,2} * x_{1,3,2,1,3} + x_{1,2,1,2,3} * x_{1,3,1,3,2}$

Orbit Size 3



Move Graph

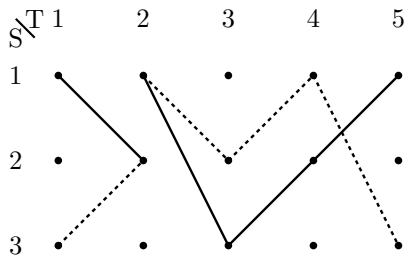
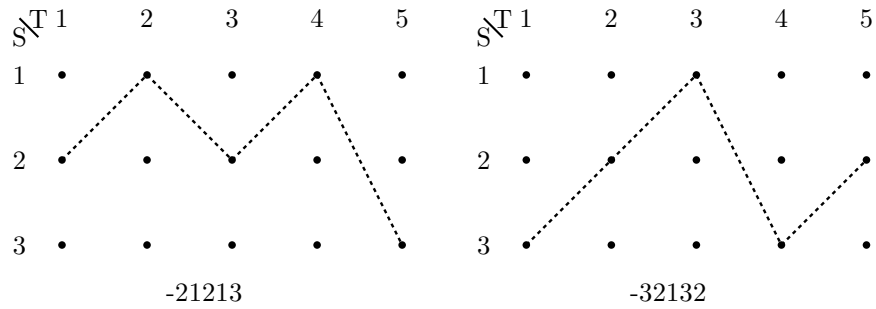
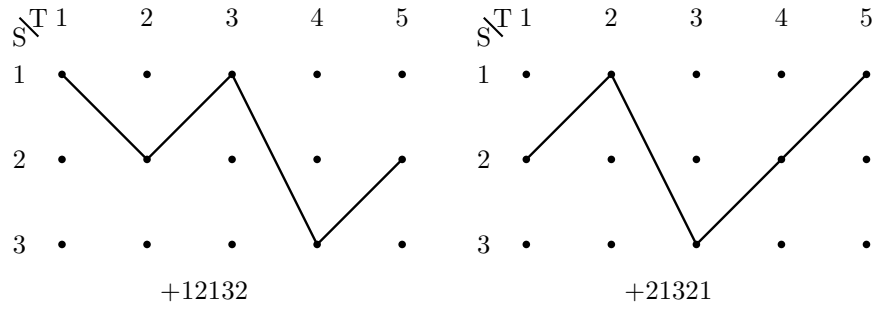
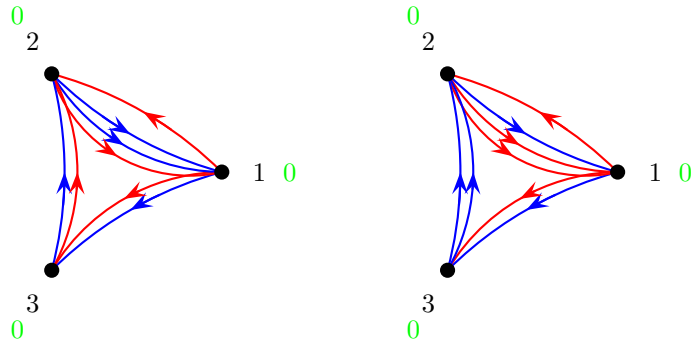
12132 13131 12131 13132
 $-x_{1,2,1,3,2} * x_{1,3,1,3,1} + x_{1,2,1,3,1} * x_{1,3,1,3,2}$



Move Graph

31312 13213 12131 13132
 $-x_{3,1,3,1,2} * x_{1,3,2,1,3} + x_{1,2,1,3,1} * x_{1,3,1,3,2}$

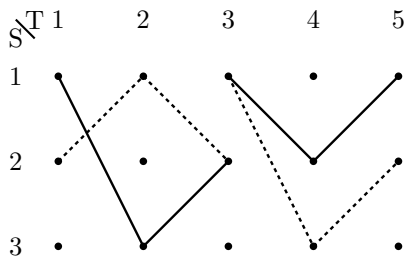
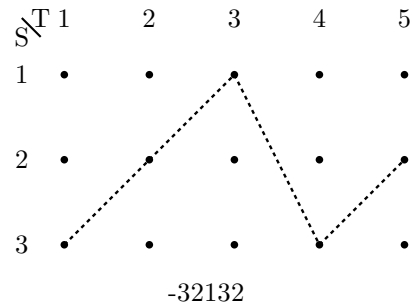
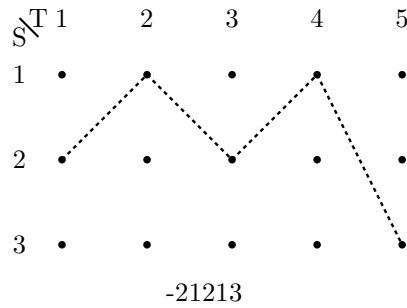
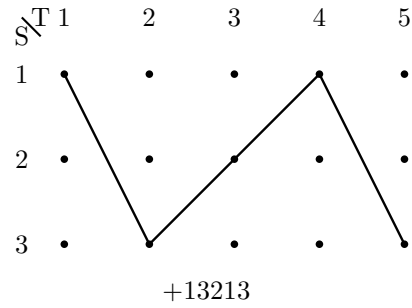
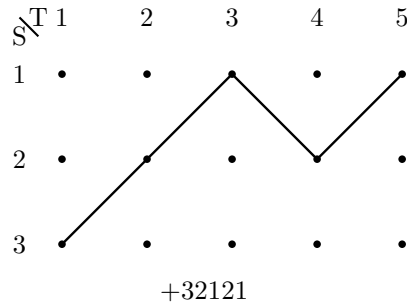
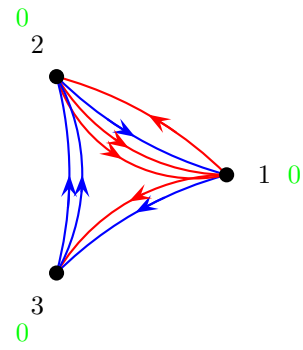
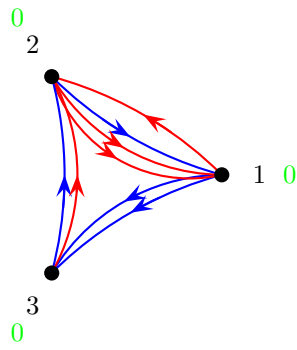
Orbit Size 3



Move Graph

$$12132 \ 21321 \ 21213 \ 32132$$

$$-x_{1,2,1,3,2} * x_{2,1,3,2,1} + x_{2,1,2,1,3} * x_{3,2,1,3,2}$$

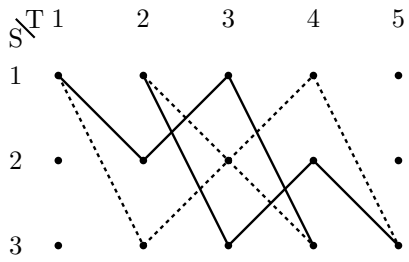
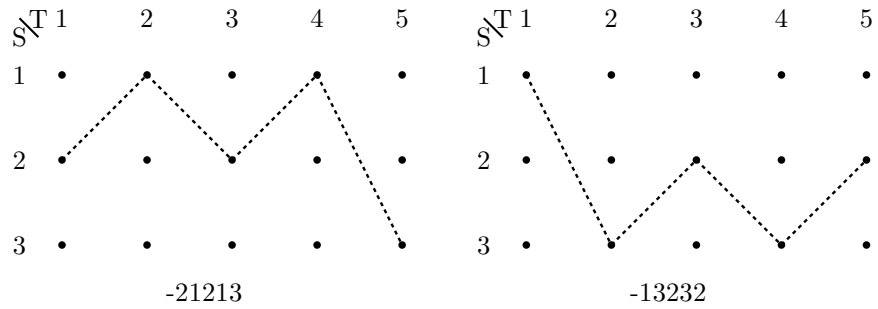
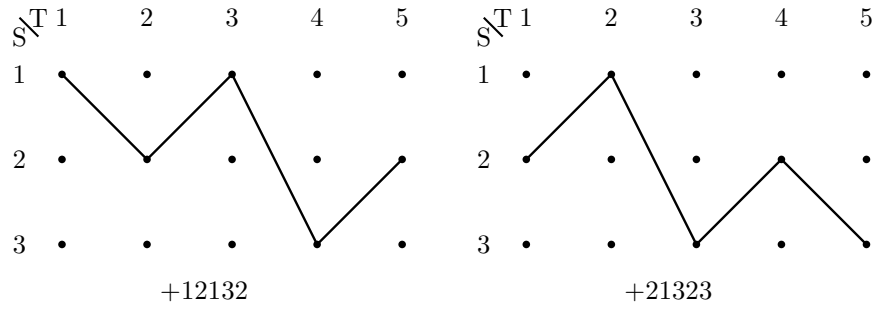
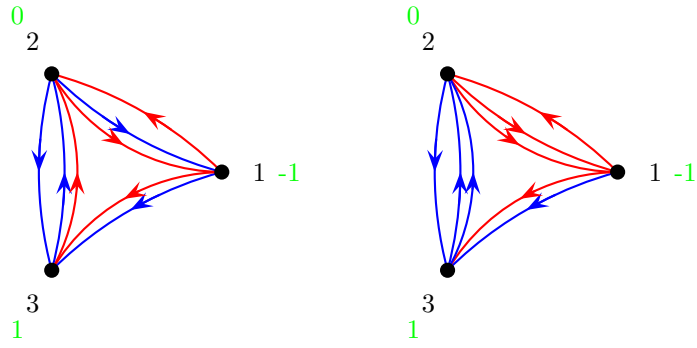


Move Graph

32121 13213 21213 32132

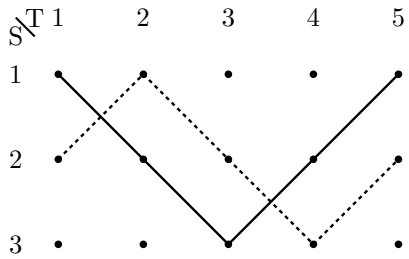
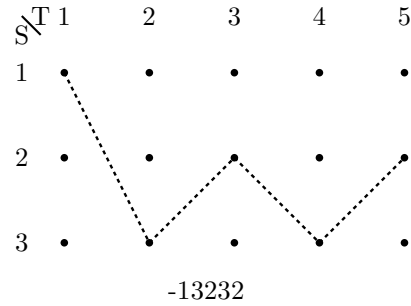
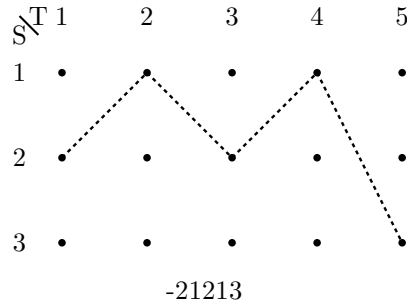
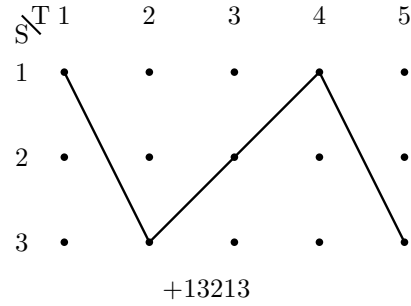
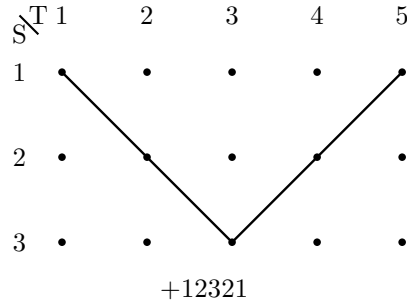
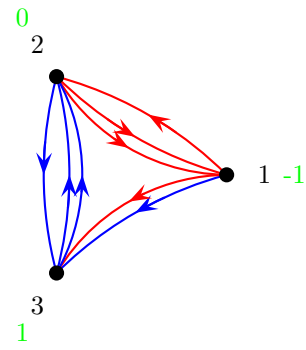
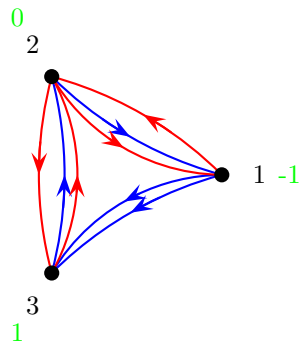
$$-x_{3,2,1,2,1} * x_{1,3,2,1,3} + x_{2,1,2,1,3} * x_{3,2,1,3,2}$$

Orbit Size 3



Move Graph

$12132 \ 21323 \ 21213 \ 13232$
 $-x_{1,2,1,3,2} * x_{2,1,3,2,3} + x_{2,1,2,1,3} * x_{1,3,2,3,2}$

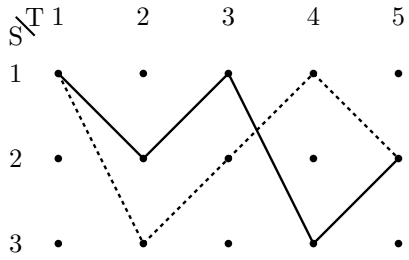
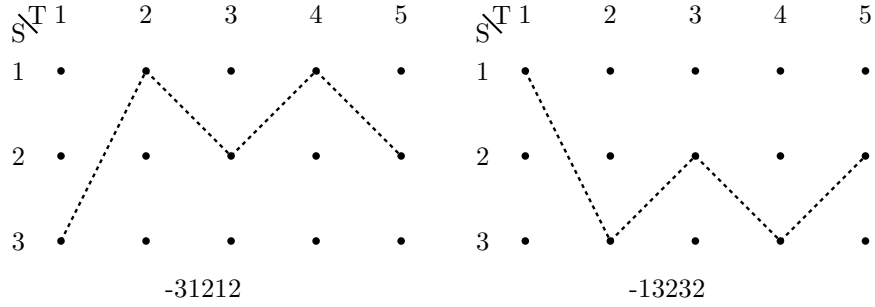
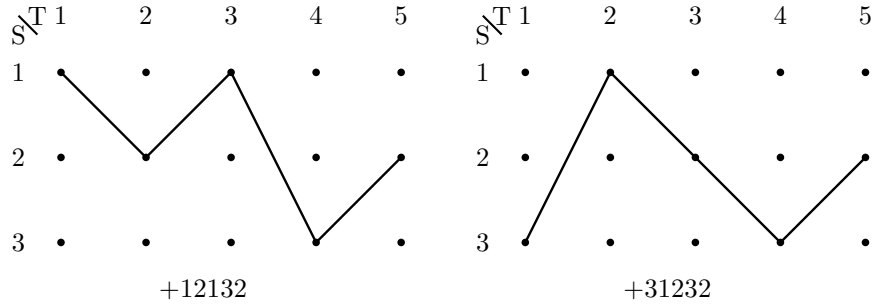
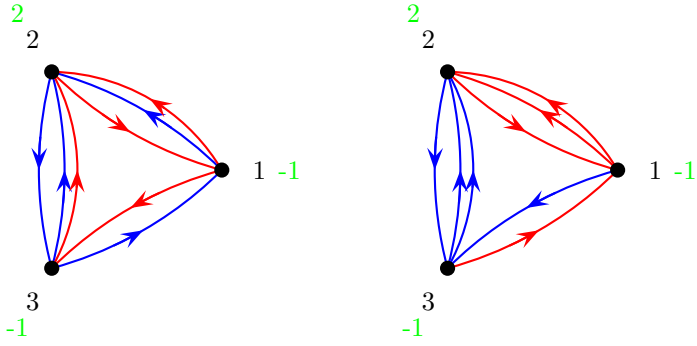


Move Graph

$$12321 \ 13213 \ 21213 \ 13232$$

$$-x_{1,2,3,2,1} * x_{1,3,2,1,3} + x_{2,1,2,1,3} * x_{1,3,2,3,2}$$

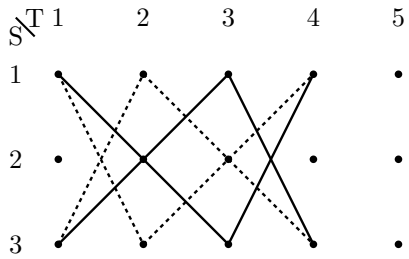
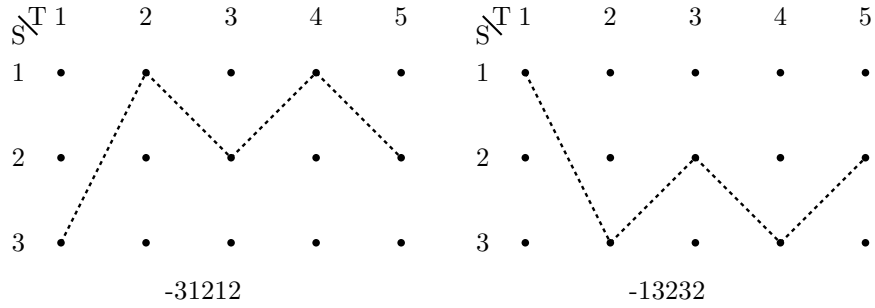
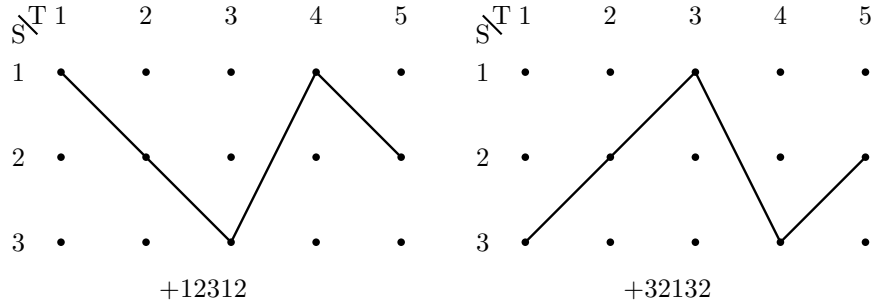
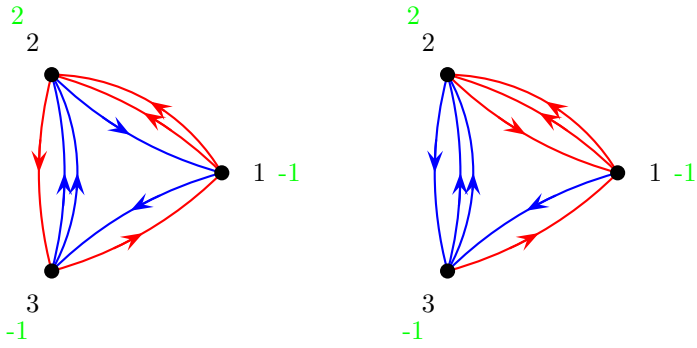
Orbit Size 3



Move Graph

$$12132 \ 31232 \ 31212 \ 13232$$

$$-x_{1,2,1,3,2} * x_{3,1,2,3,2} + x_{3,1,2,1,2} * x_{1,3,2,3,2}$$

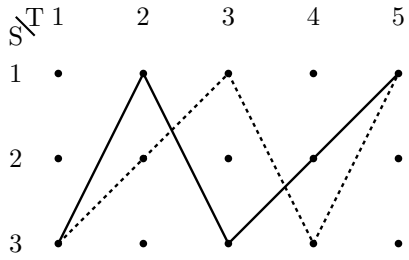
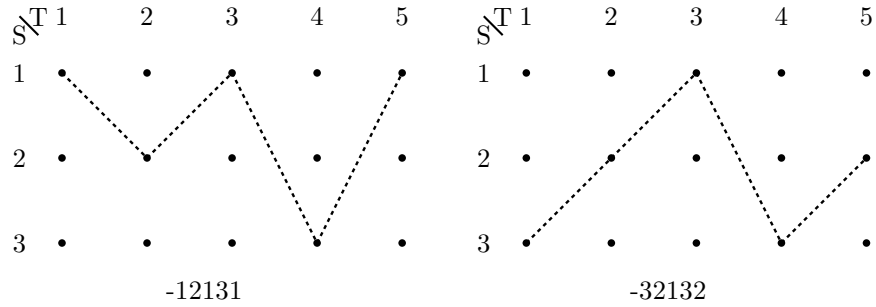
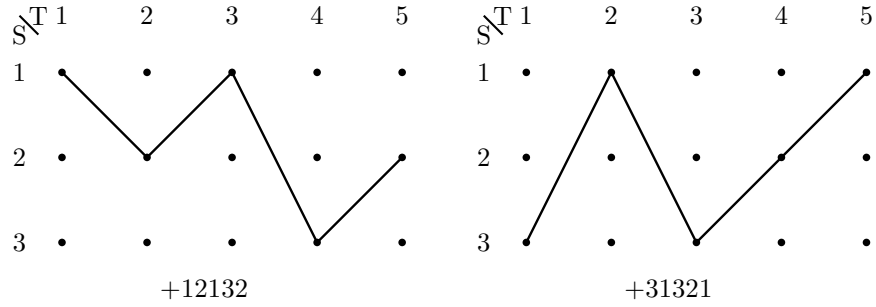
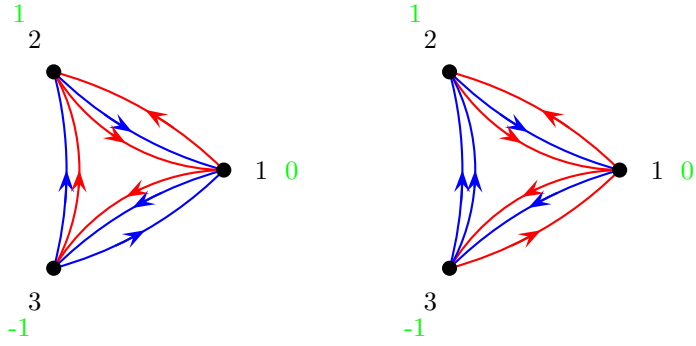


Move Graph

12312 32132 31212 13232

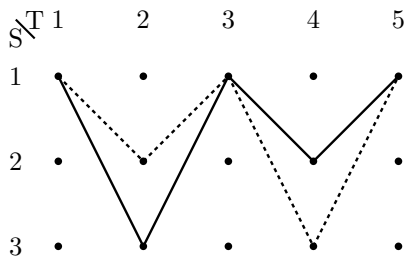
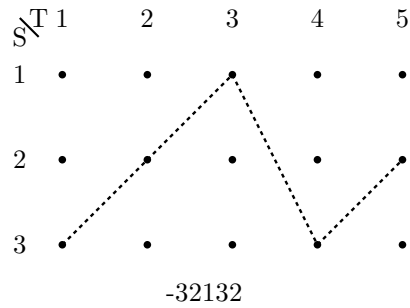
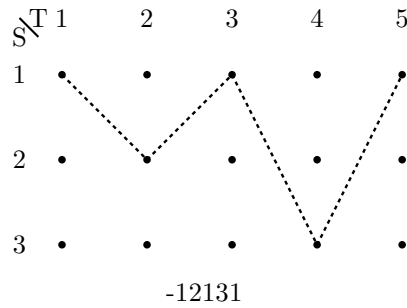
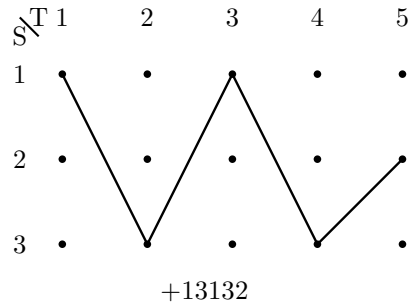
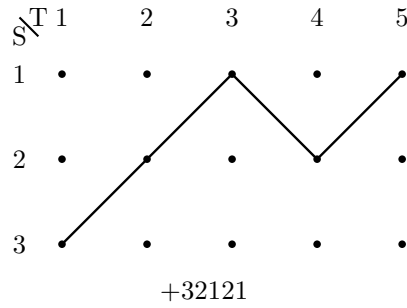
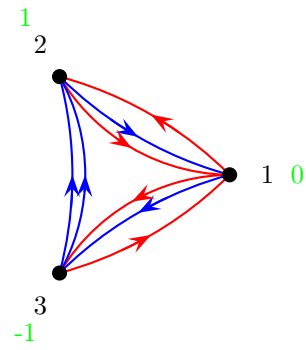
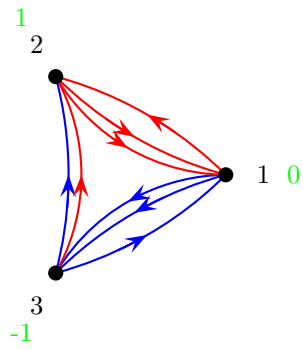
$$-x_{1,2,3,1,2} * x_{3,2,1,3,2} + x_{3,1,2,1,2} * x_{1,3,2,3,2}$$

Orbit Size 3



Move Graph

$12132 \ 31321 \ 12131 \ 32132$
 $-x_{1,2,1,3,2} * x_{3,1,3,2,1} + x_{1,2,1,3,1} * x_{3,2,1,3,2}$

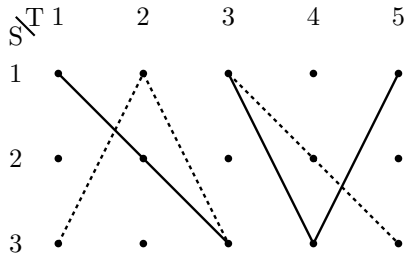
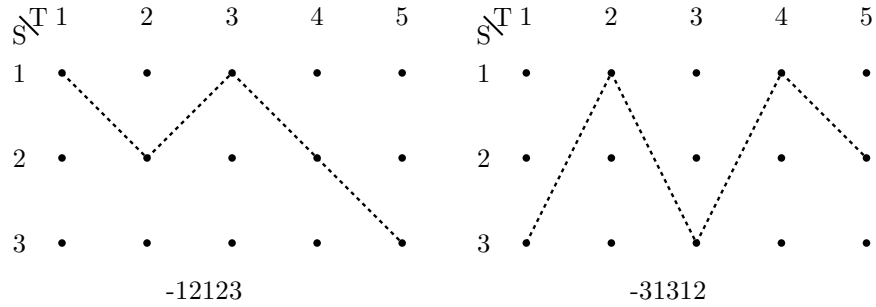
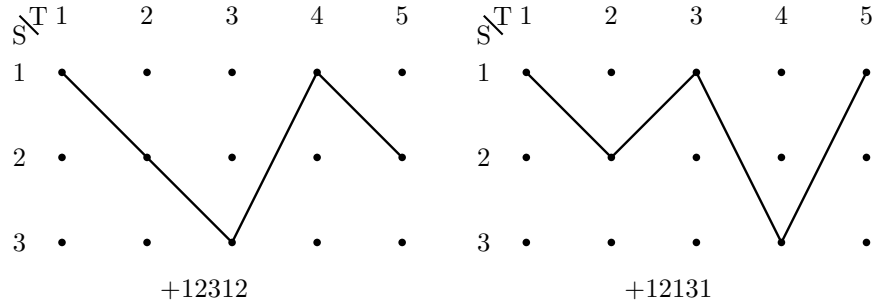
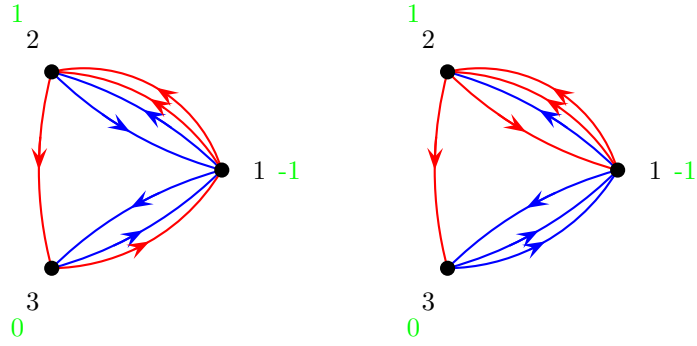


Move Graph

32121 13132 12131 32132

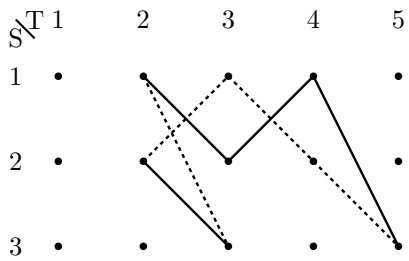
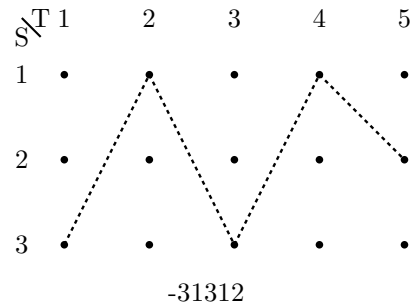
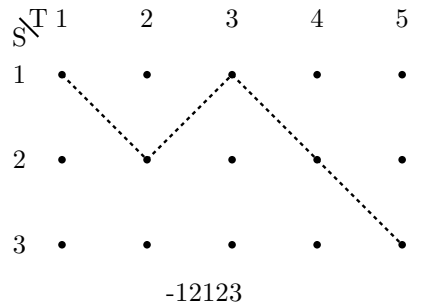
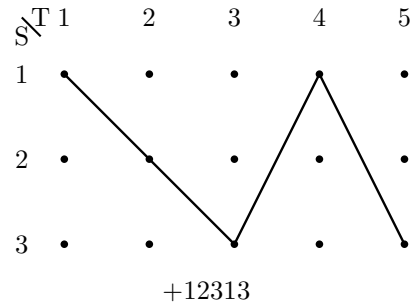
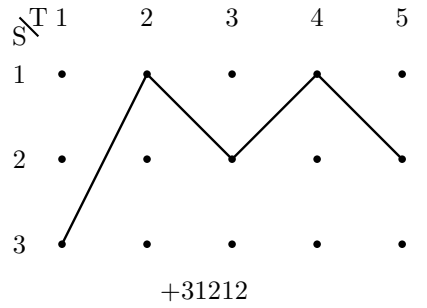
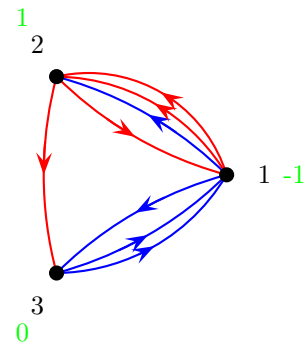
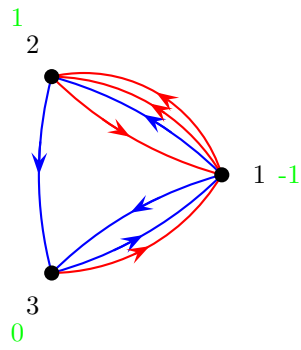
$$-x_{3,2,1,2,1} * x_{1,3,1,3,2} + x_{1,2,1,3,1} * x_{3,2,1,3,2}$$

Orbit Size 3



Move Graph

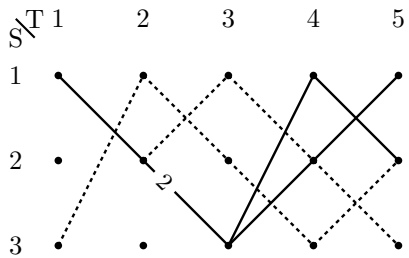
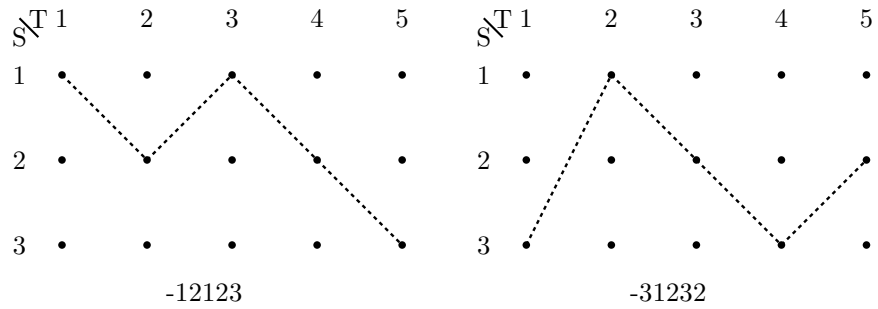
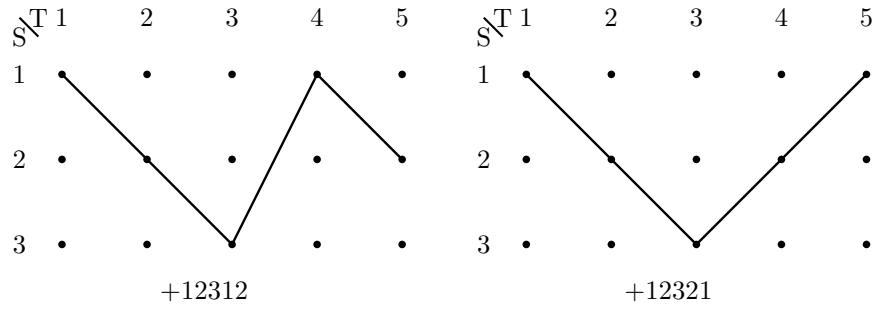
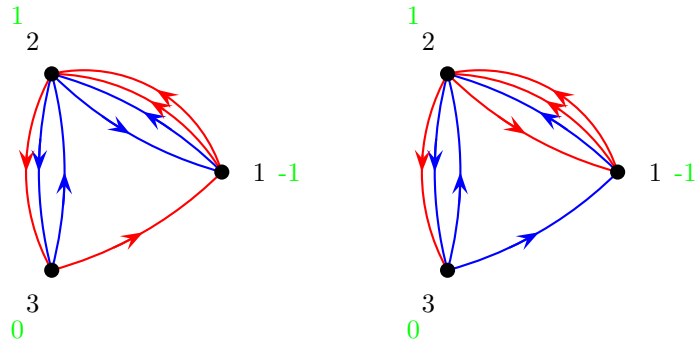
$12312 \ 12131 \ 12123 \ 31312$
 $-x_{1,2,3,1,2} * x_{1,2,1,3,1} + x_{1,2,1,2,3} * x_{3,1,3,1,2}$



Move Graph

31212 12313 12123 31312
 $-x_{3,1,2,1,2} * x_{1,2,3,1,3} + x_{1,2,1,2,3} * x_{3,1,3,1,2}$

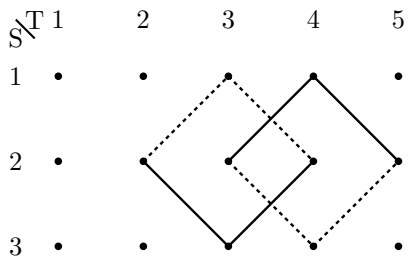
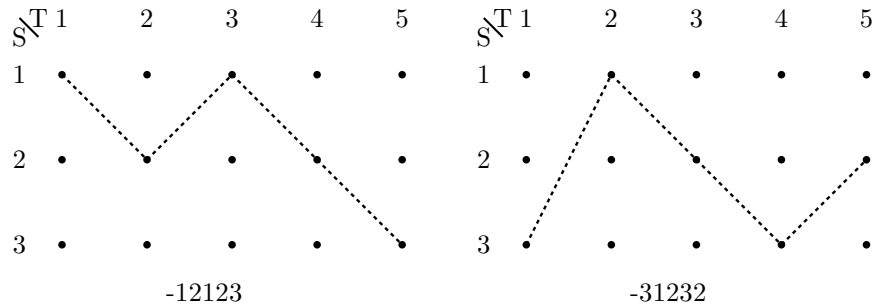
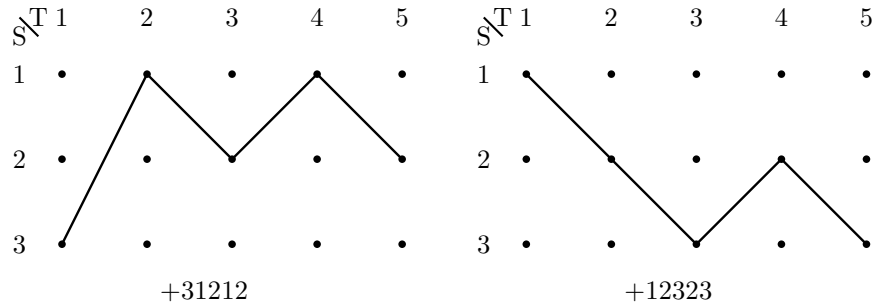
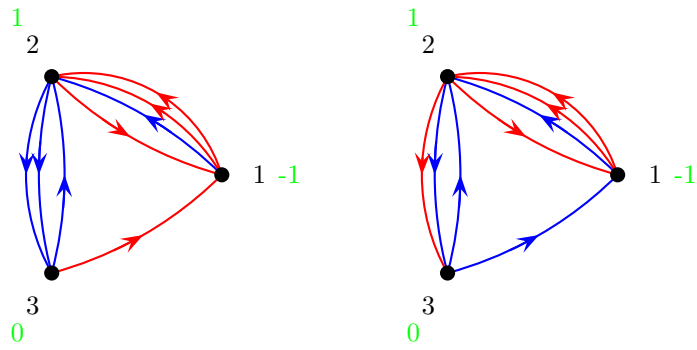
Orbit Size 3



Move Graph

$$12312 \ 12321 \ 12123 \ 31232$$

$$-x_{1,2,3,1,2} * x_{1,2,3,2,1} + x_{1,2,1,2,3} * x_{3,1,2,3,2}$$

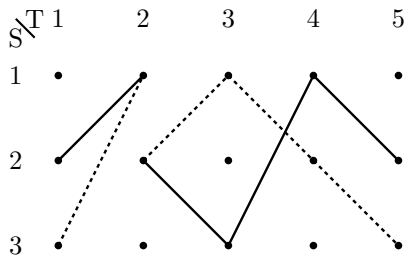
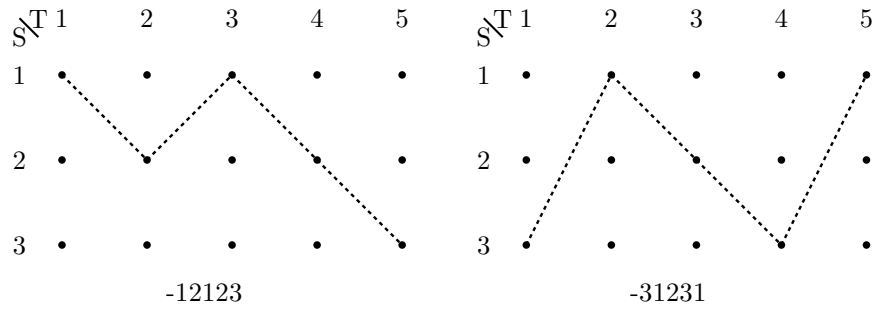
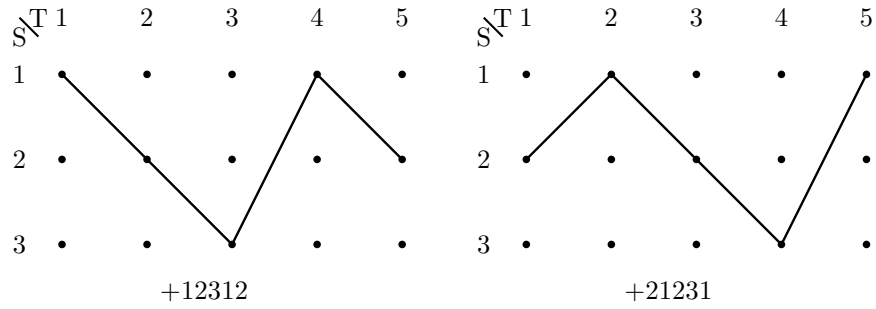
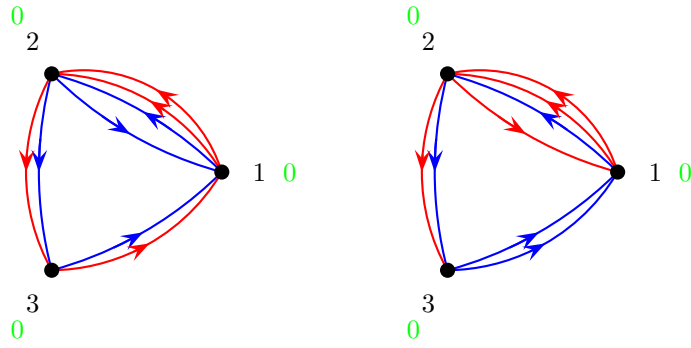


Move Graph

$$31212 \ 12323 \ 12123 \ 31232$$

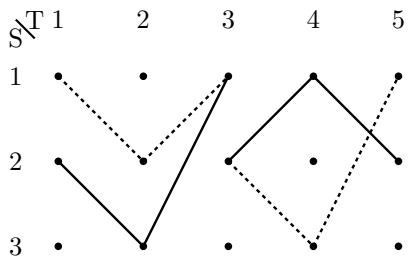
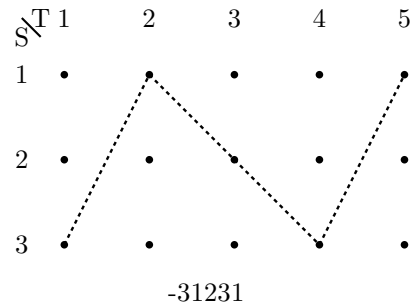
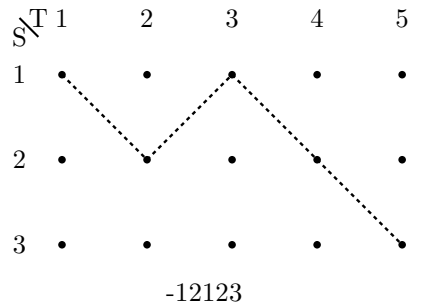
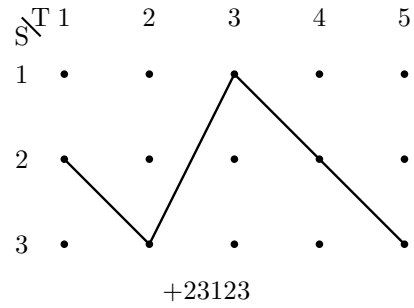
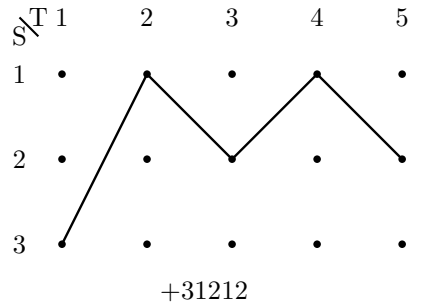
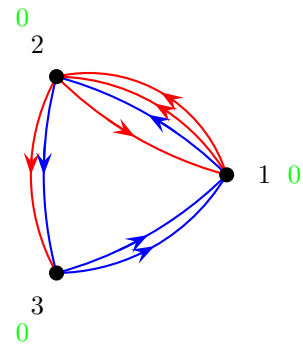
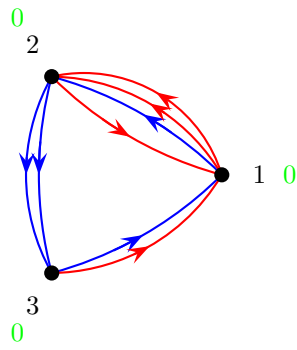
$$-x_{3,1,2,1,2} * x_{1,2,3,2,3} + x_{1,2,1,2,3} * x_{3,1,2,3,2}$$

Orbit Size 3



Move Graph

$12312 \ 21231 \ 12123 \ 31231$
 $-x_{1,2,3,1,2} * x_{2,1,2,3,1} + x_{1,2,1,2,3} * x_{3,1,2,3,1}$

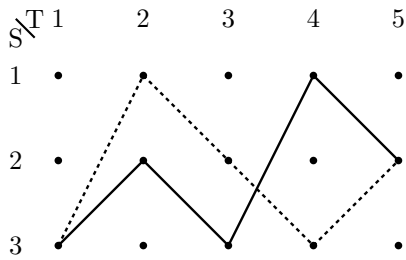
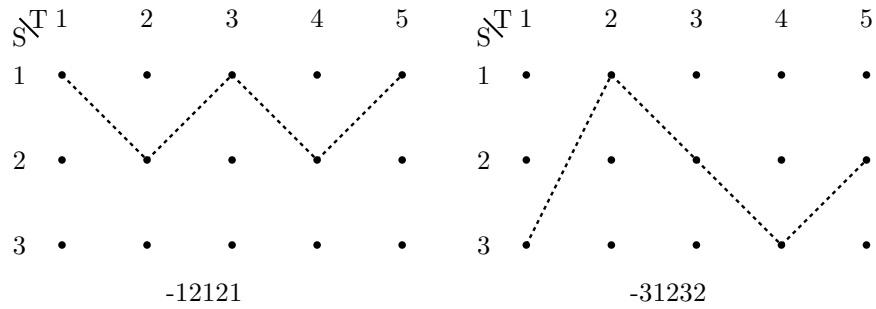
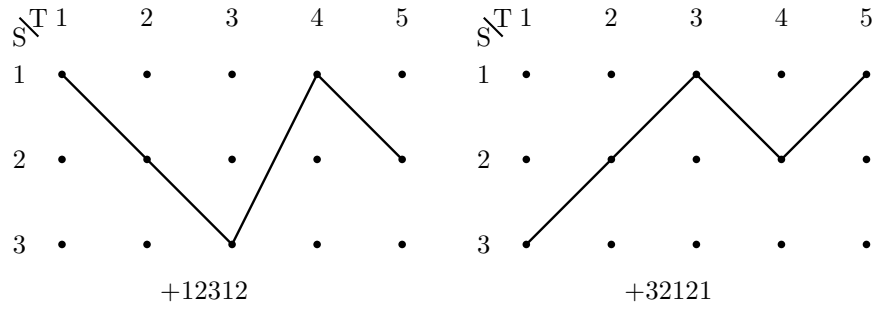
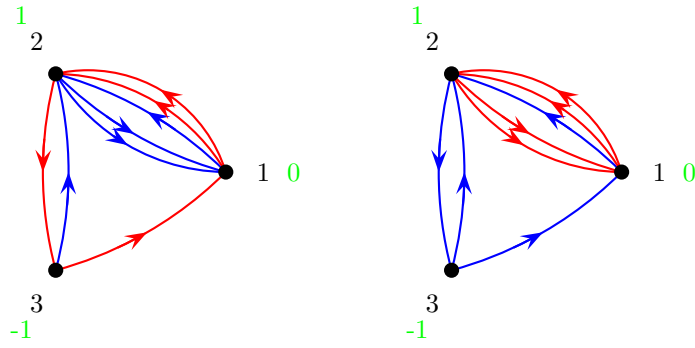


Move Graph

31212 23123 12123 31231

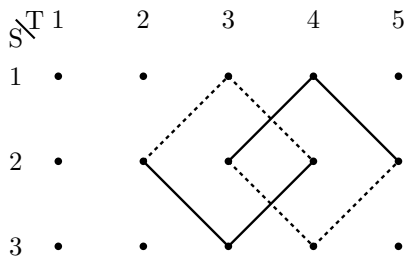
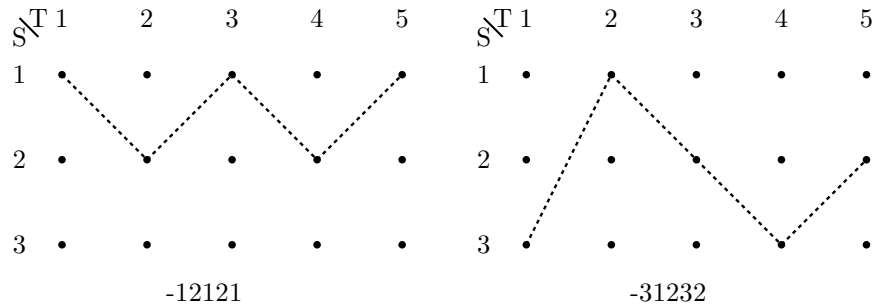
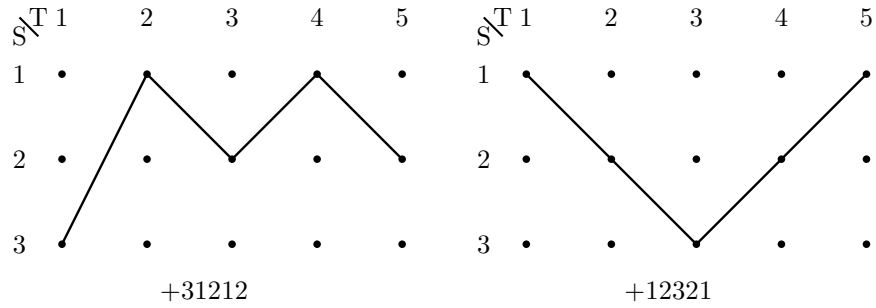
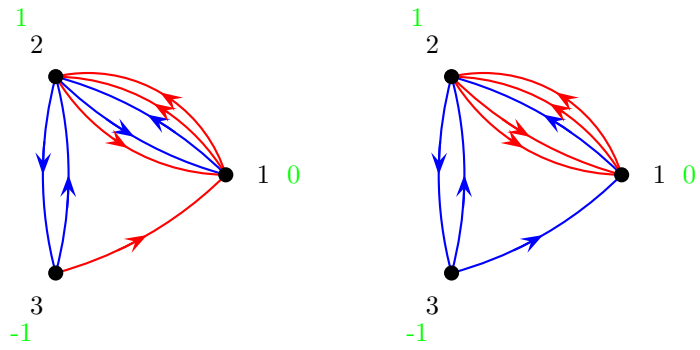
$$-x_{3,1,2,1,2} * x_{2,3,1,2,3} + x_{1,2,1,2,3} * x_{3,1,2,3,1}$$

Orbit Size 3



Move Graph

$12312 \ 32121 \ 12121 \ 31232$
 $-x_{1,2,3,1,2} * x_{3,2,1,2,1} + x_{1,2,1,2,1} * x_{3,1,2,3,2}$

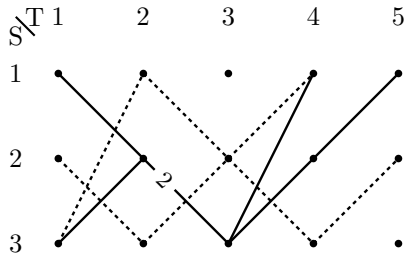
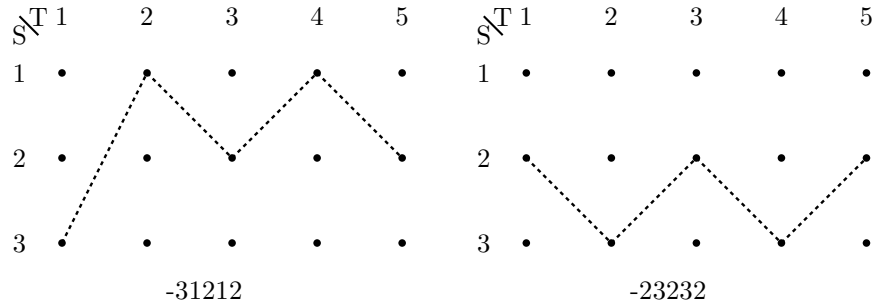
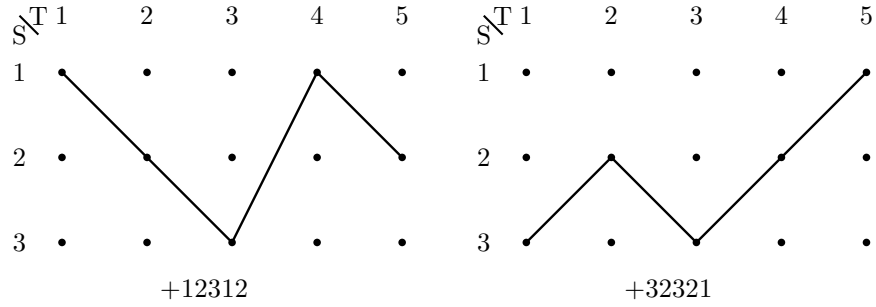
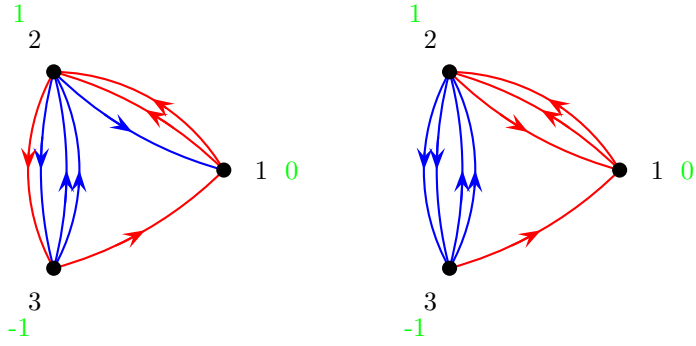


Move Graph

$$31212 \ 12321 \ 12121 \ 31232$$

$$-x_{3,1,2,1,2} * x_{1,2,3,2,1} + x_{1,2,1,2,1} * x_{3,1,2,3,2}$$

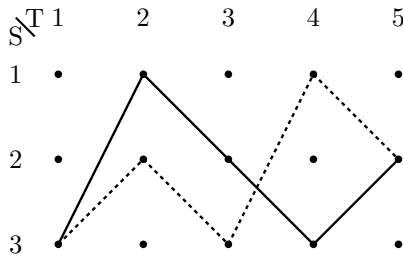
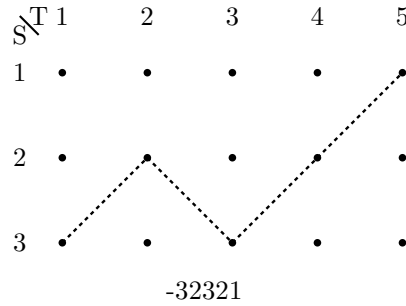
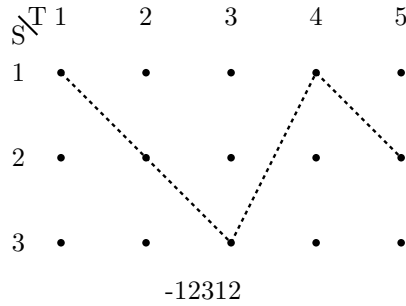
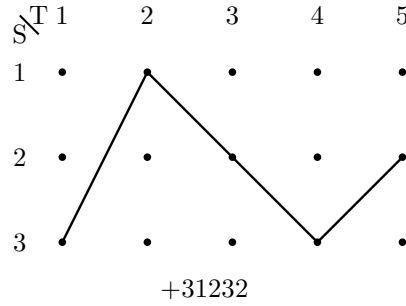
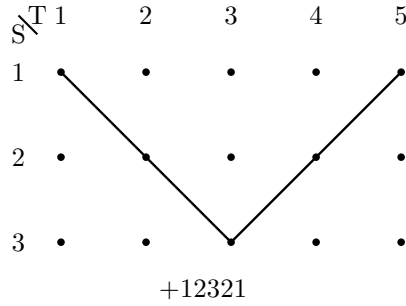
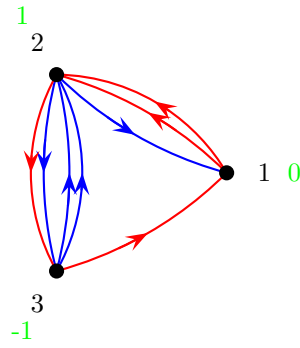
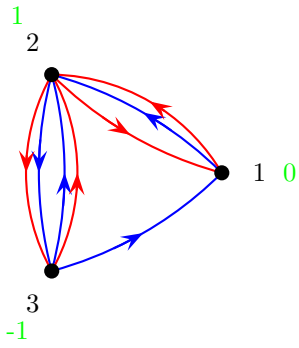
Orbit Size 3



Move Graph

$$12312 \ 32321 \ 31212 \ 23232$$

$$-x_{1,2,3,1,2} * x_{3,2,3,2,1} + x_{3,1,2,1,2} * x_{2,3,2,3,2}$$

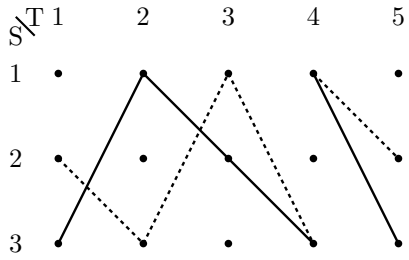
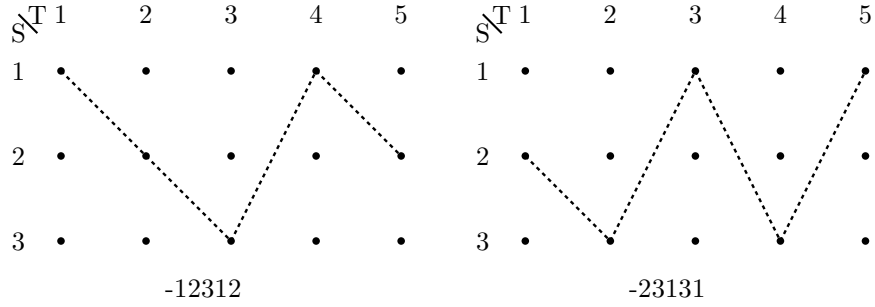
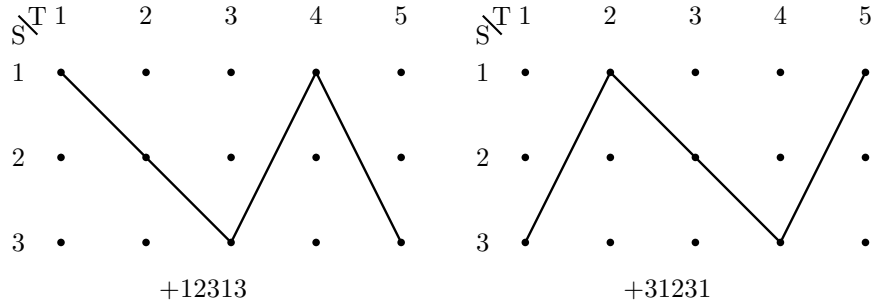
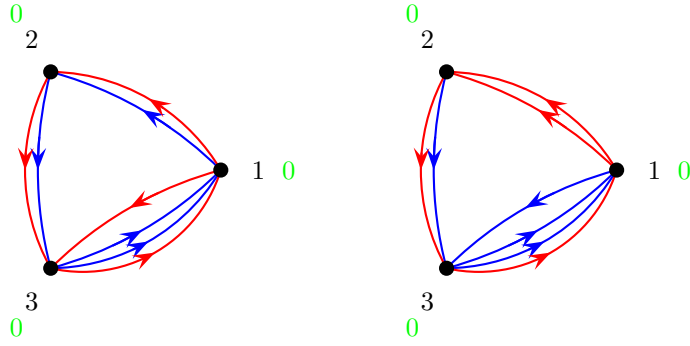


Move Graph

12321 31232 12312 32321

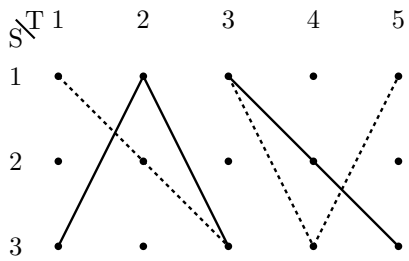
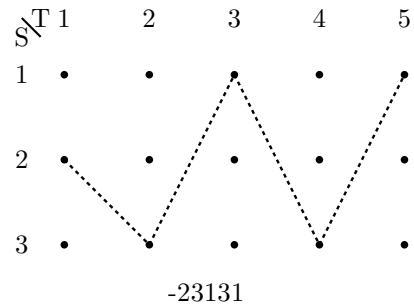
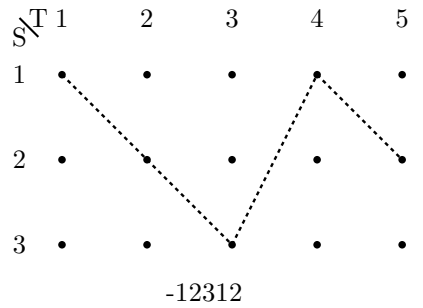
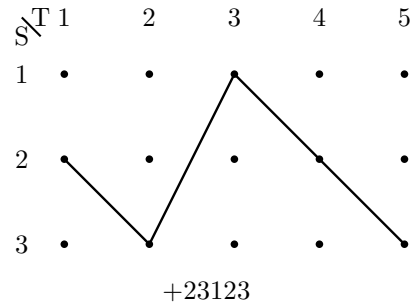
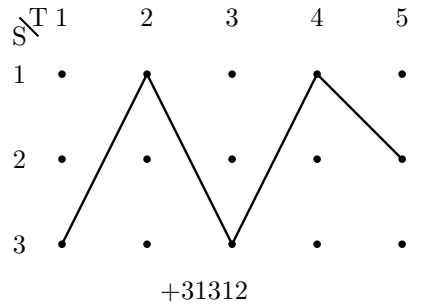
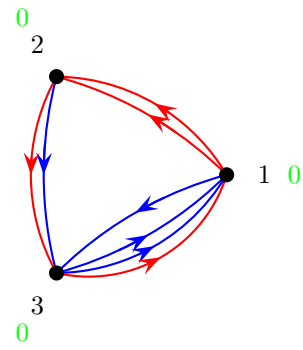
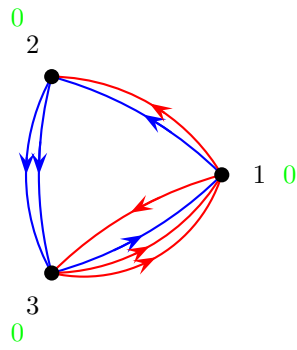
$$-x_{1,2,3,2,1} * x_{3,1,2,3,2} + x_{1,2,3,1,2} * x_{3,2,3,2,1}$$

Orbit Size 3



Move Graph

$12313 \ 31231 \ 12312 \ 23131$
 $-x_{1,2,3,1,3} * x_{3,1,2,3,1} + x_{1,2,3,1,2} * x_{2,3,1,3,1}$

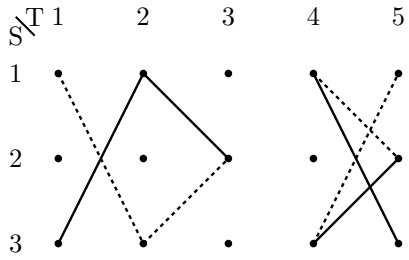
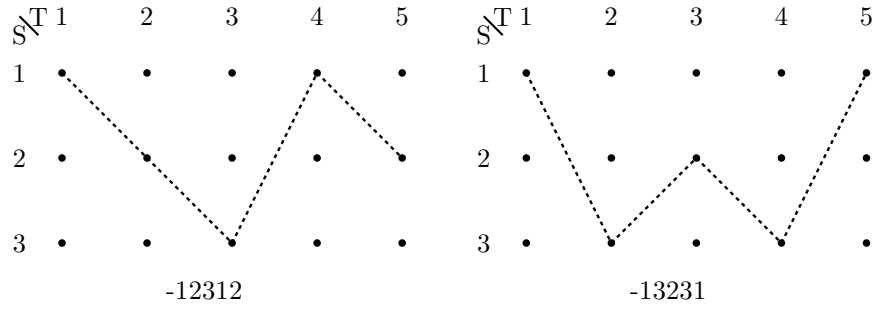
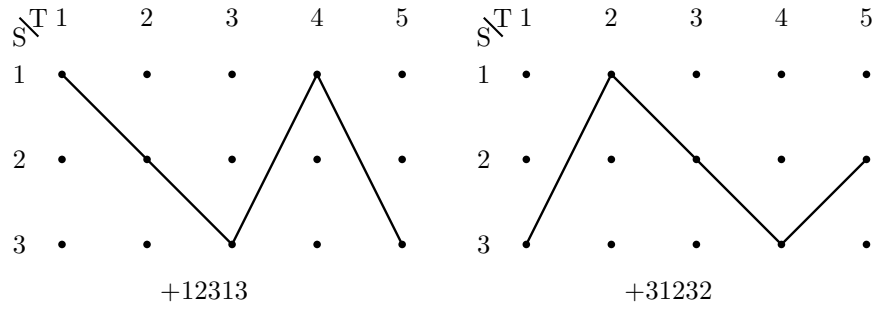
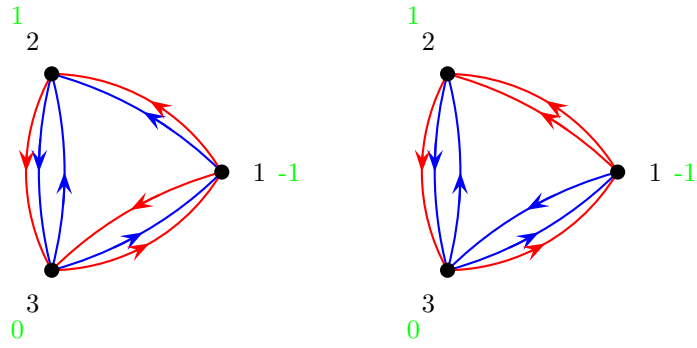


Move Graph

$$31312 \ 23123 \ 12312 \ 23131$$

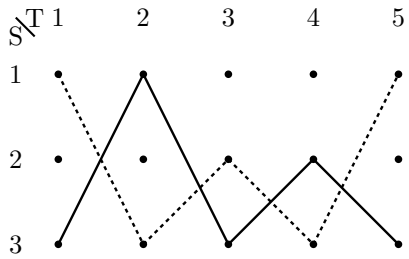
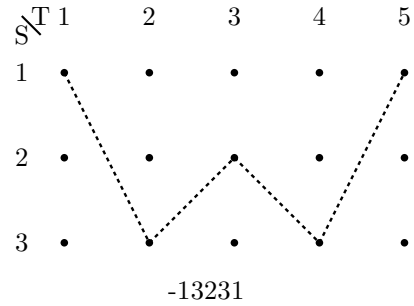
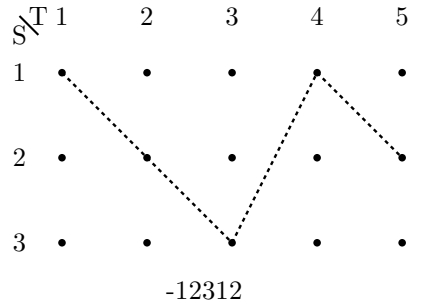
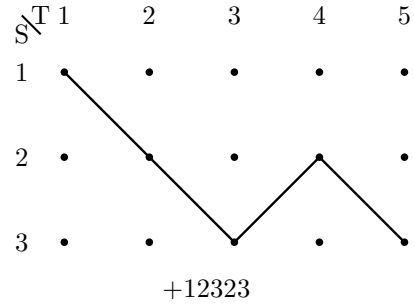
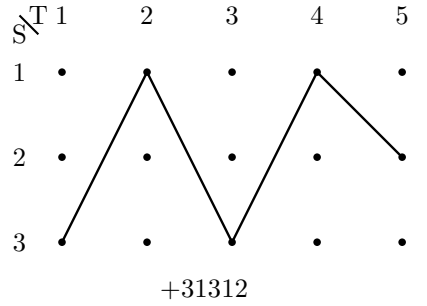
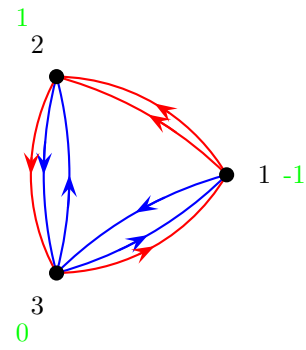
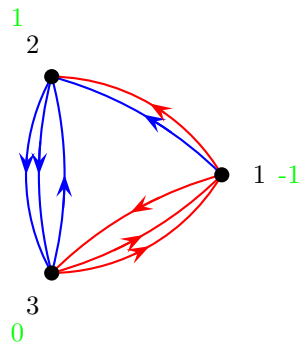
$$-x_{3,1,3,1,2} * x_{2,3,1,2,3} + x_{1,2,3,1,2} * x_{2,3,1,3,1}$$

Orbit Size 3



Move Graph

$12313 \ 31232 \ 12312 \ 13231$
 $-x_{1,2,3,1,3} * x_{3,1,2,3,2} + x_{1,2,3,1,2} * x_{1,3,2,3,1}$

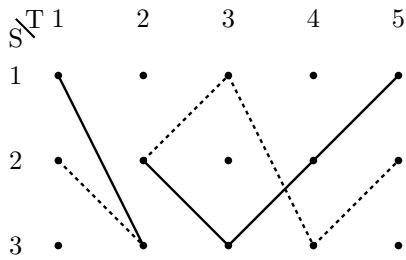
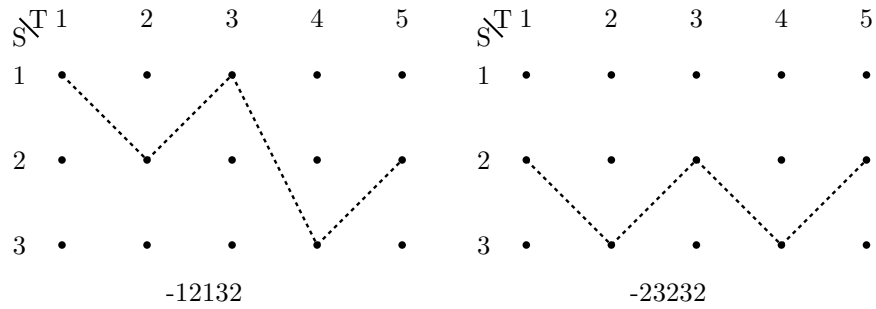
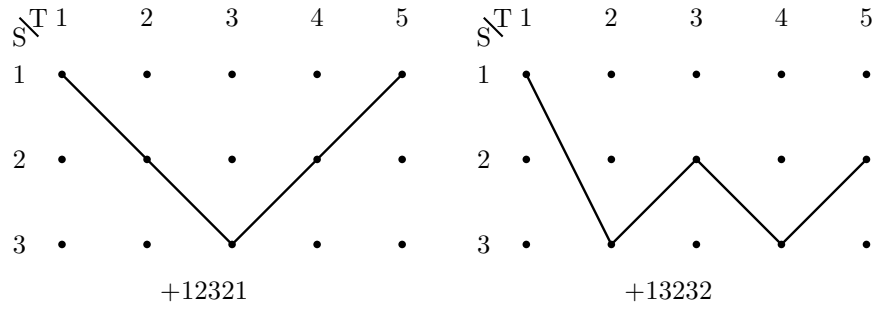
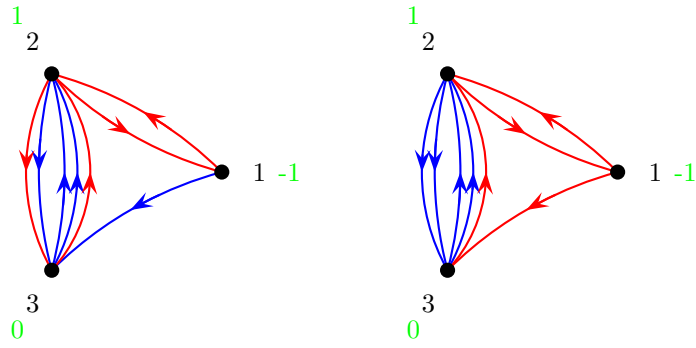


Move Graph

$$31312 \ 12323 \ 12312 \ 13231$$

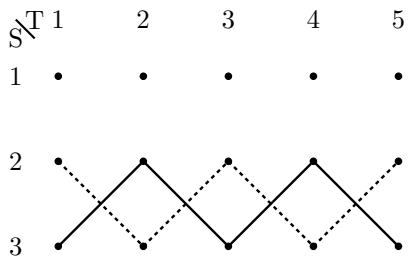
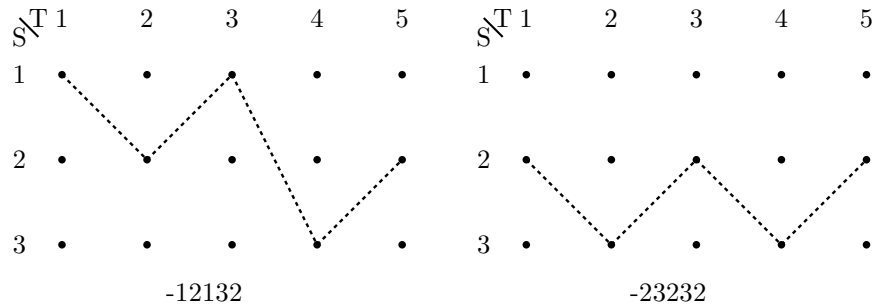
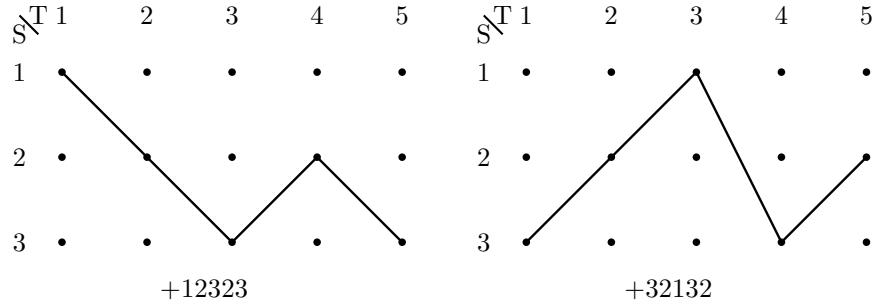
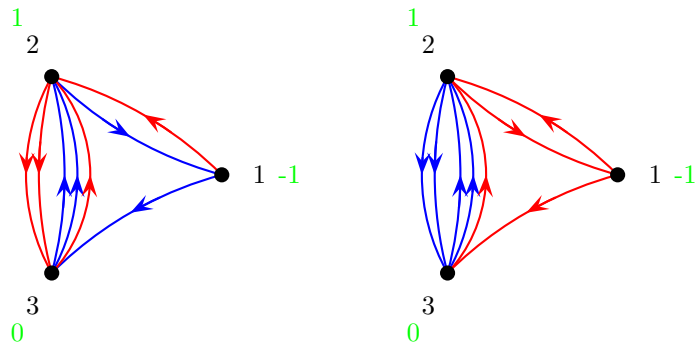
$$-x_{3,1,3,1,2} * x_{1,2,3,2,3} + x_{1,2,3,1,2} * x_{1,3,2,3,1}$$

Orbit Size 3



Move Graph

$12321 \ 13232 \ 12132 \ 23232$
 $-x_{1,2,3,2,1} * x_{1,3,2,3,2} + x_{1,2,1,3,2} * x_{2,3,2,3,2}$

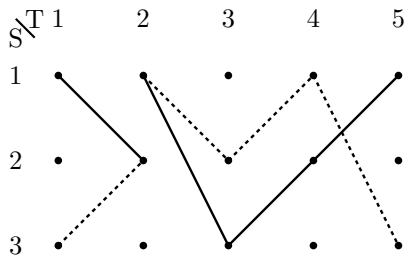
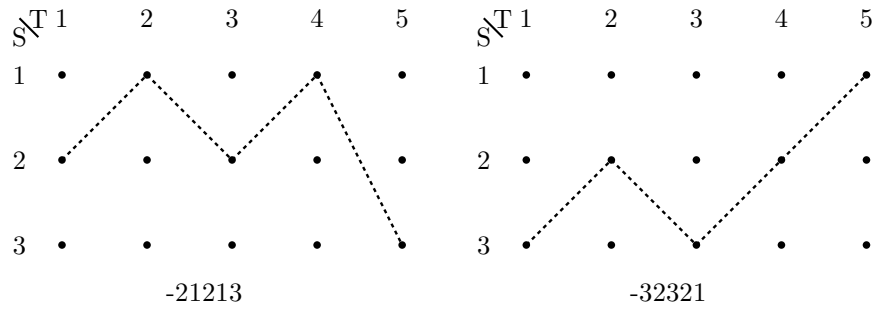
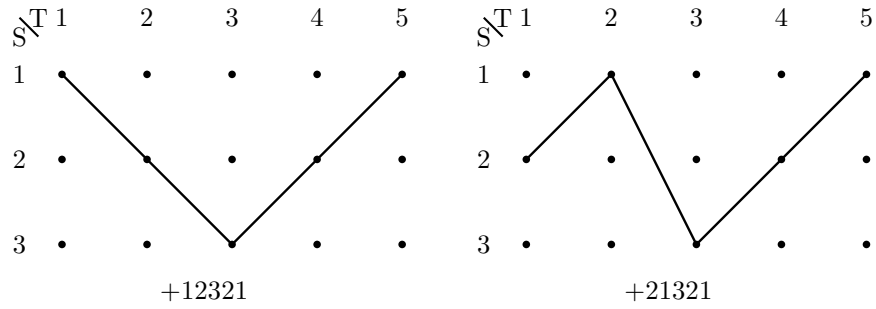
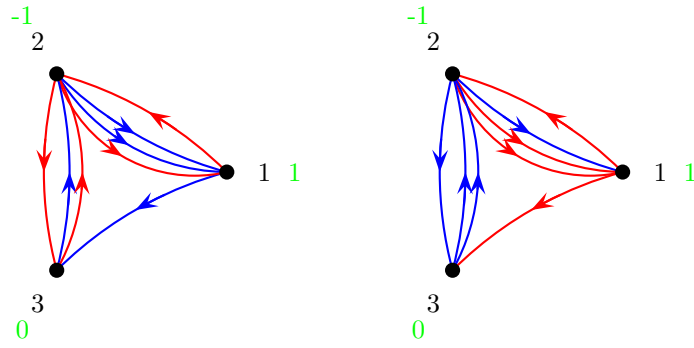


Move Graph

$$12323 \ 32132 \ 12132 \ 23232$$

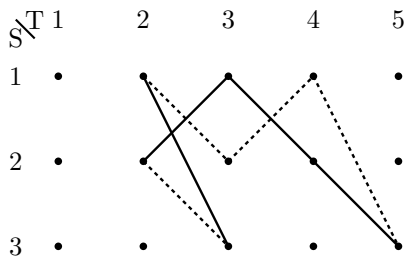
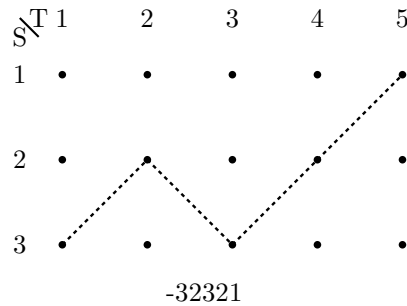
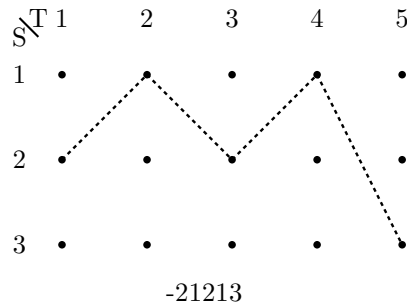
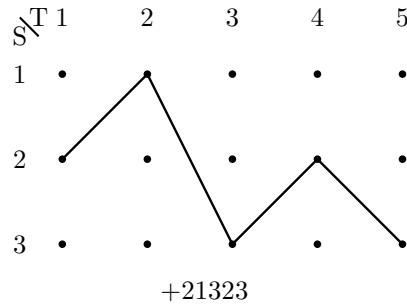
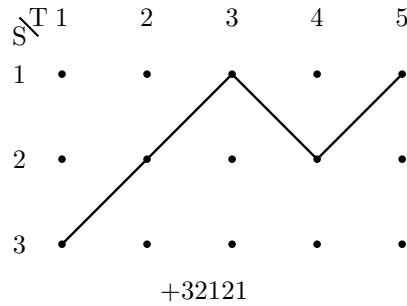
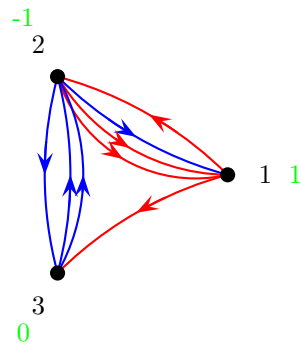
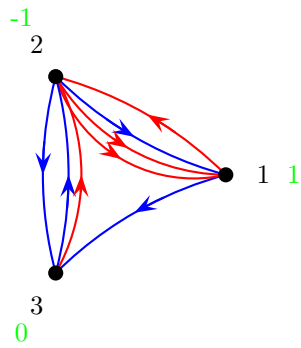
$$-x_{1,2,3,2,3} * x_{3,2,1,3,2} + x_{1,2,1,3,2} * x_{2,3,2,3,2}$$

Orbit Size 3



Move Graph

$12321 \ 21321 \ 21213 \ 32321$
 $-x_{1,2,3,2,1} * x_{2,1,3,2,1} + x_{2,1,2,1,3} * x_{3,2,3,2,1}$

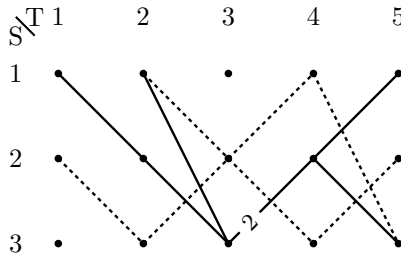
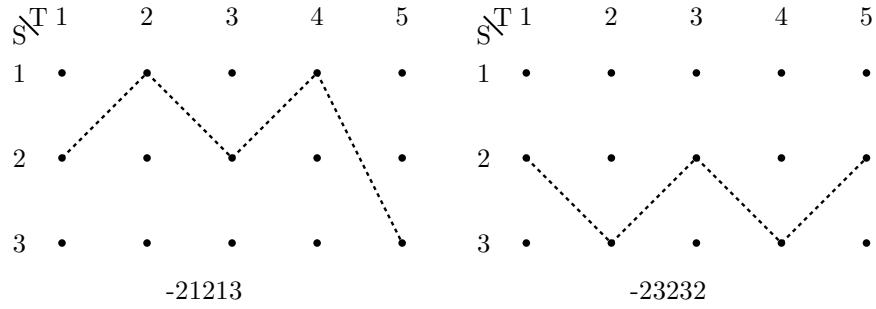
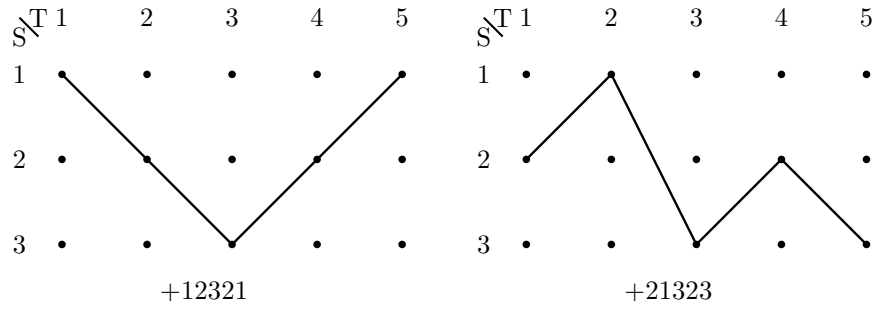
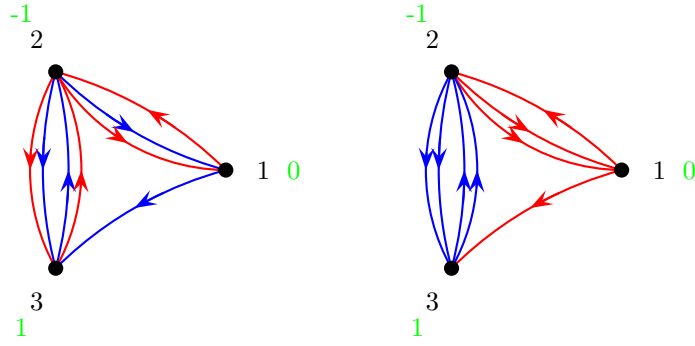


Move Graph

32121 21323 21213 32321

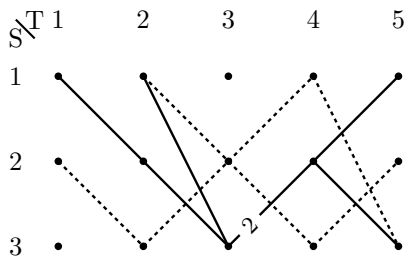
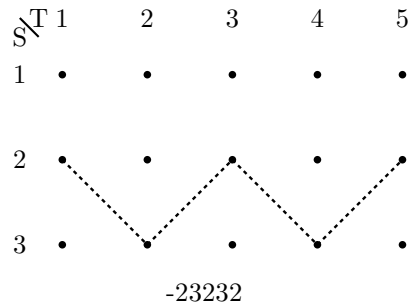
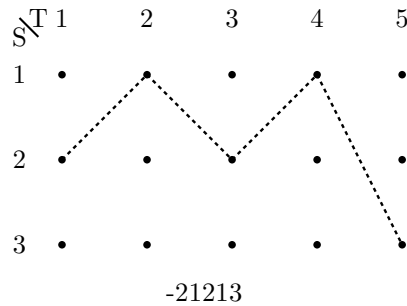
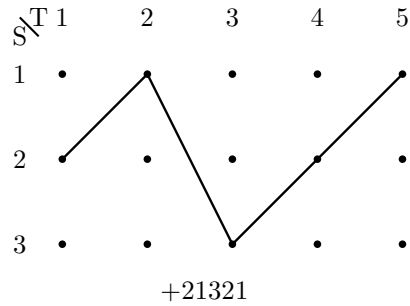
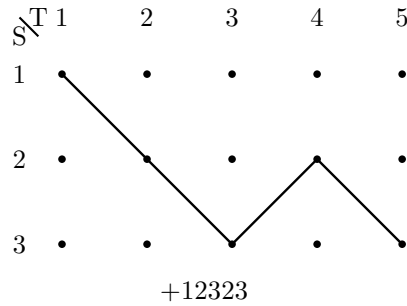
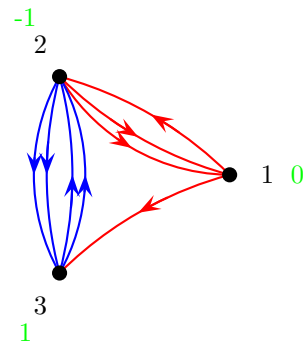
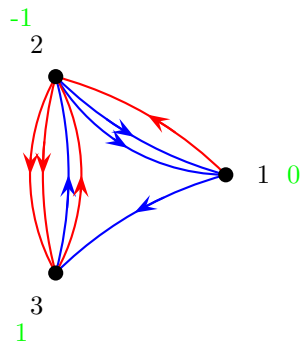
$$-x_{3,2,1,2,1} * x_{2,1,3,2,3} + x_{2,1,2,1,3} * x_{3,2,3,2,1}$$

Orbit Size 3



Move Graph

$12321 \ 21323 \ 21213 \ 23232$
 $-x_{1,2,3,2,1} * x_{2,1,3,2,3} + x_{2,1,2,1,3} * x_{2,3,2,3,2}$

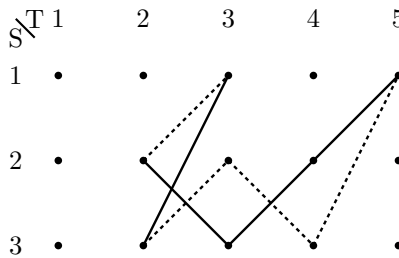
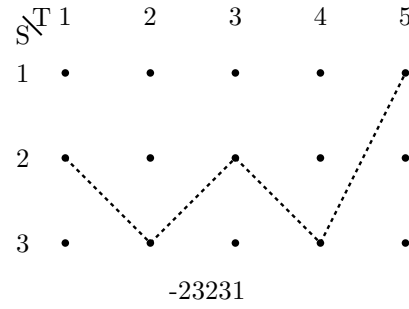
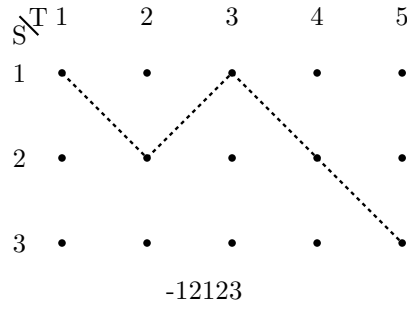
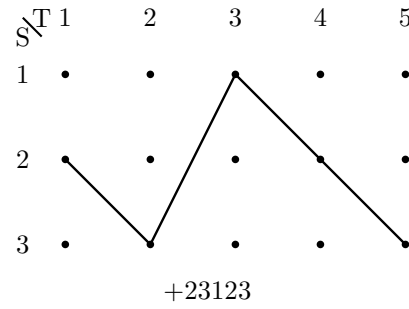
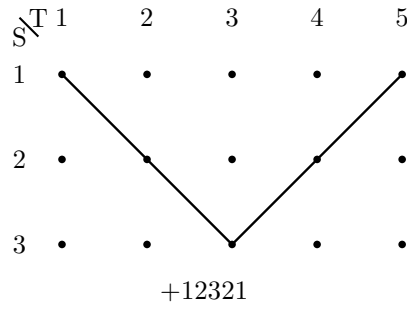
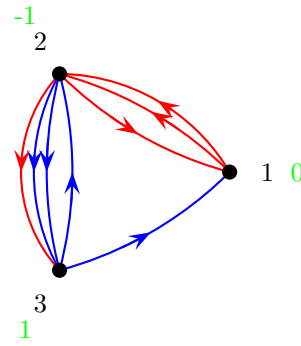
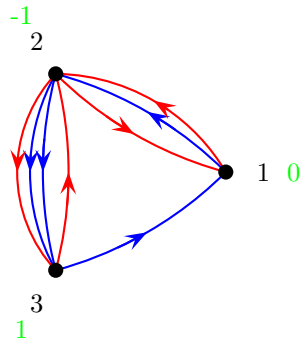


Move Graph

$$12323 \ 21321 \ 21213 \ 23232$$

$$-x_{1,2,3,2,3} * x_{2,1,3,2,1} + x_{2,1,2,1,3} * x_{2,3,2,3,2}$$

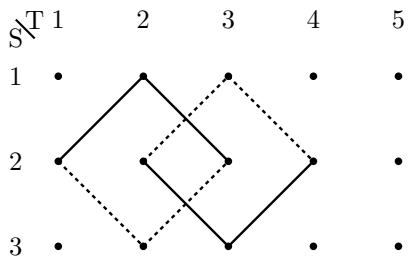
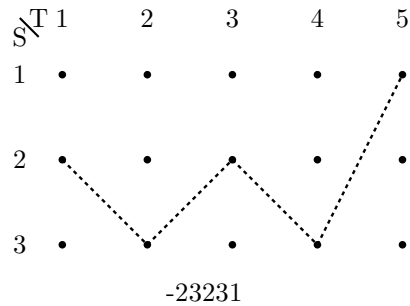
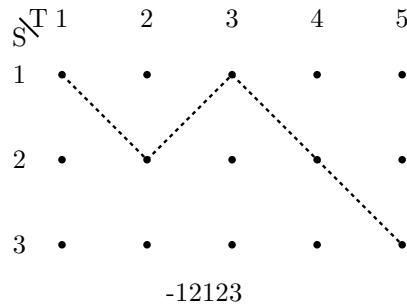
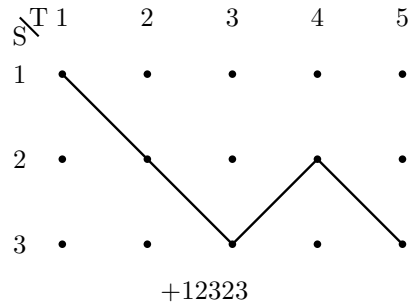
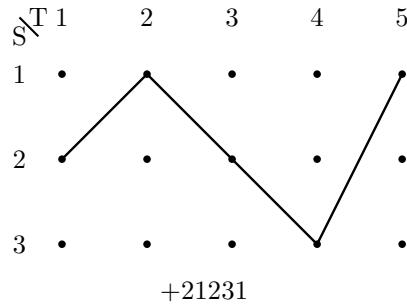
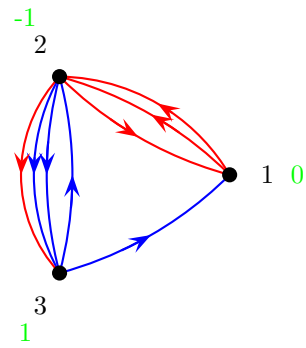
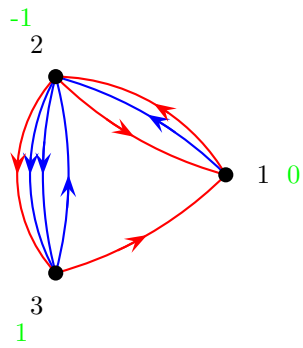
Orbit Size 3



Move Graph

$$12321 \ 23123 \ 12123 \ 23231$$

$$-x_{1,2,3,2,1} * x_{2,3,1,2,3} + x_{1,2,1,2,3} * x_{2,3,2,3,1}$$

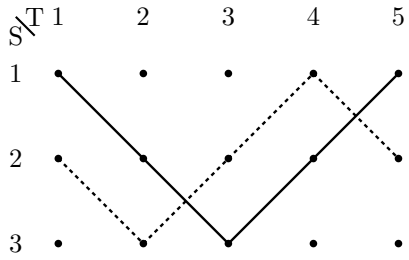
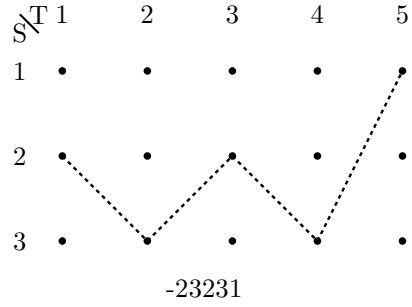
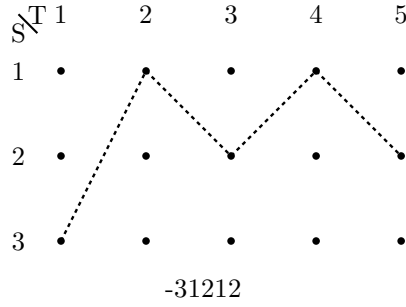
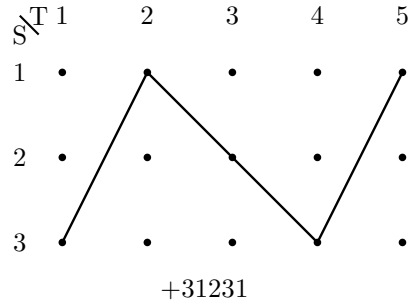
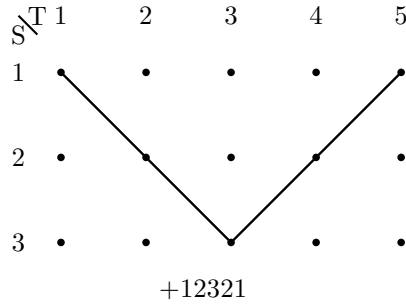
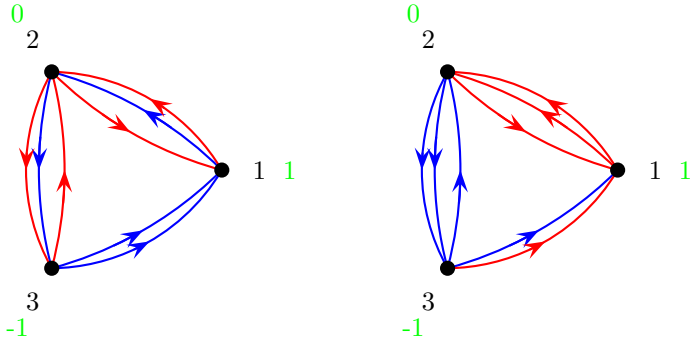


Move Graph

21231 12323 12123 23231

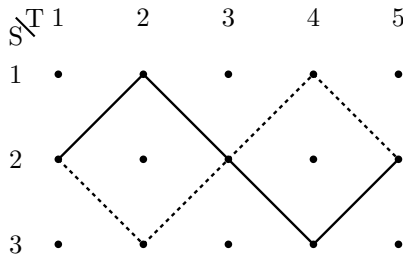
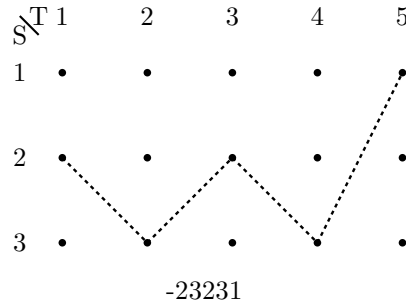
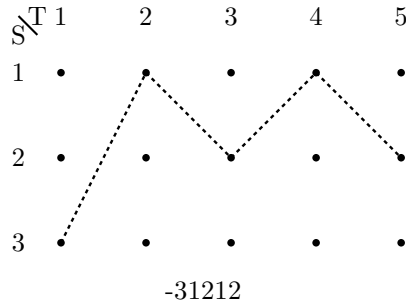
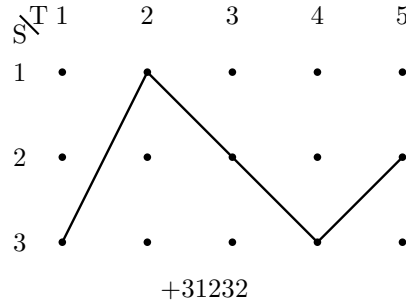
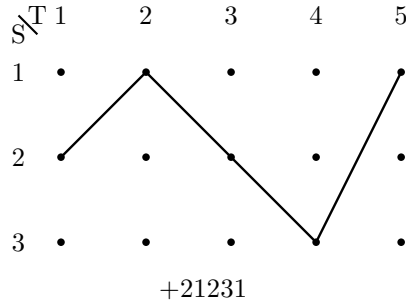
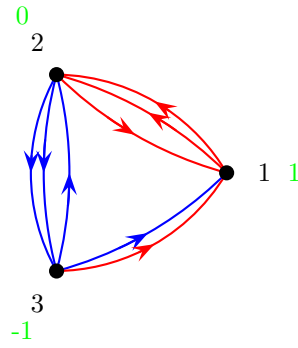
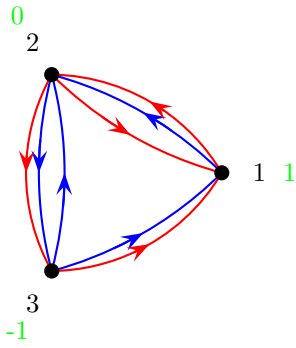
$$-x_{2,1,2,3,1} * x_{1,2,3,2,3} + x_{1,2,1,2,3} * x_{2,3,2,3,1}$$

Orbit Size 3



Move Graph

12321 31231 31212 23231
 $-x_{1,2,3,2,1} * x_{3,1,2,3,1} + x_{3,1,2,1,2} * x_{2,3,2,3,1}$

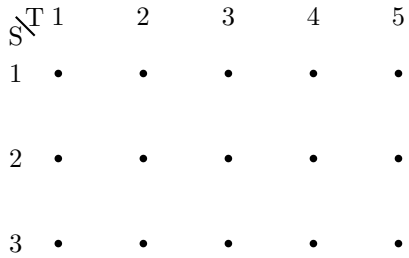
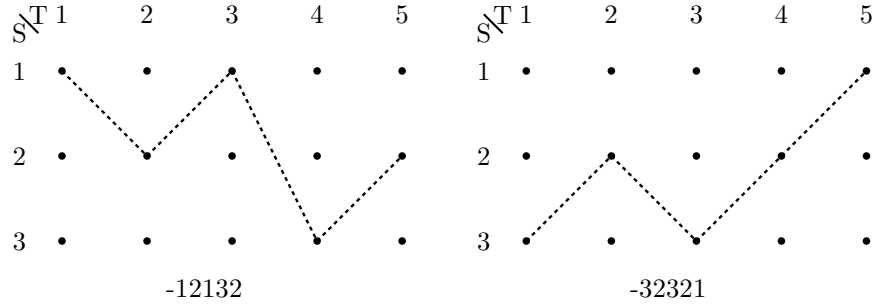
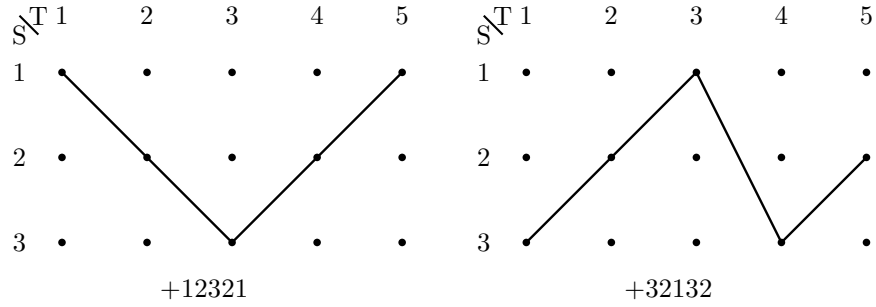
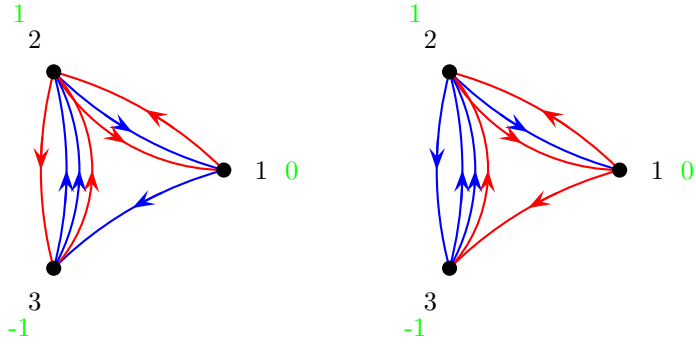


Move Graph

21231 31232 31212 23231

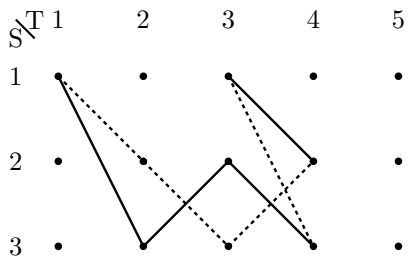
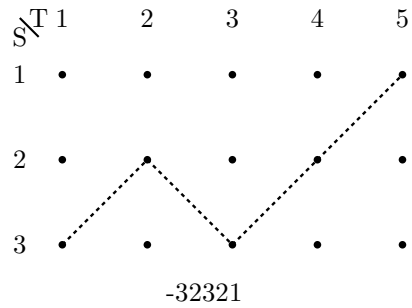
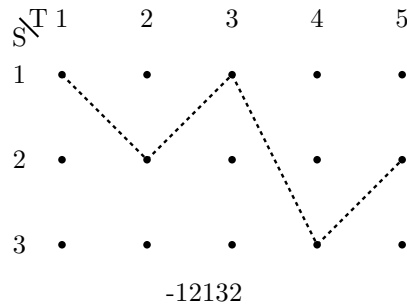
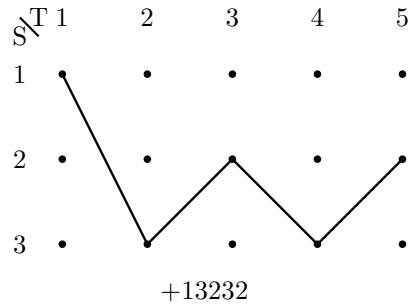
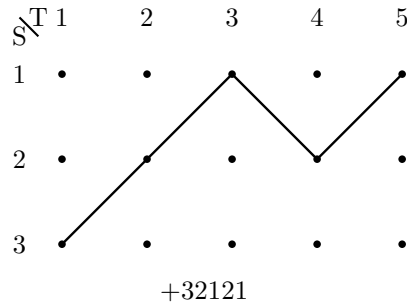
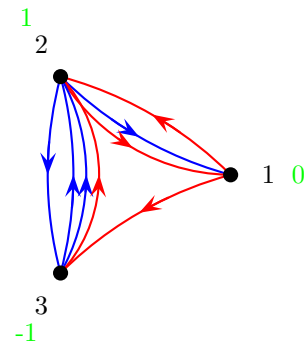
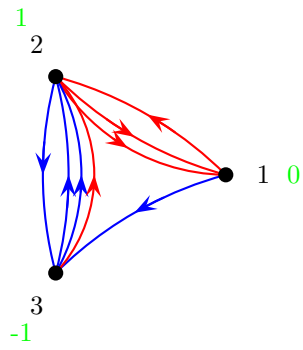
$$-x_{2,1,2,3,1} * x_{3,1,2,3,2} + x_{3,1,2,1,2} * x_{2,3,2,3,1}$$

Orbit Size 3



Move Graph

$12321 \ 32132 \ 12132 \ 32321$
 $-x_{1,2,3,2,1} * x_{3,2,1,3,2} + x_{1,2,1,3,2} * x_{3,2,3,2,1}$

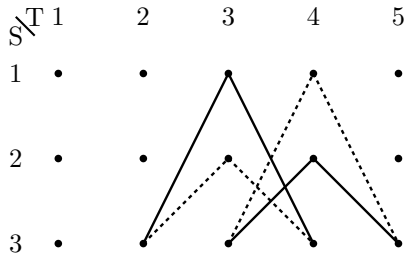
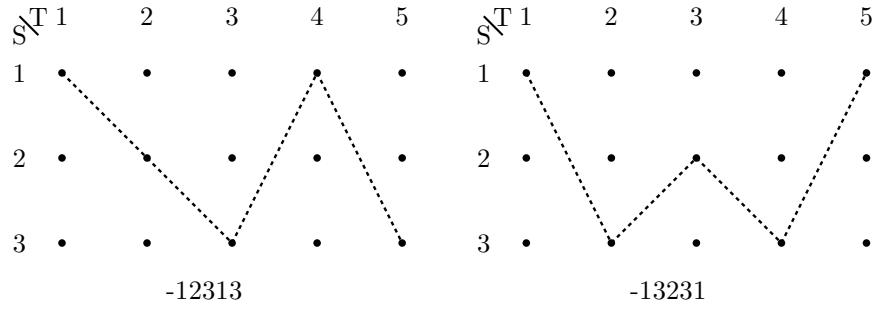
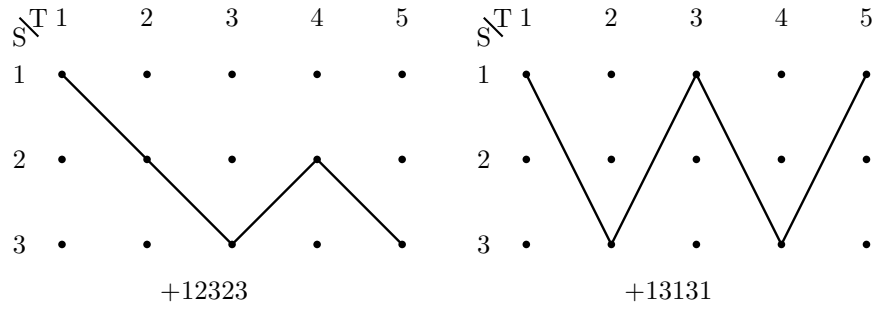
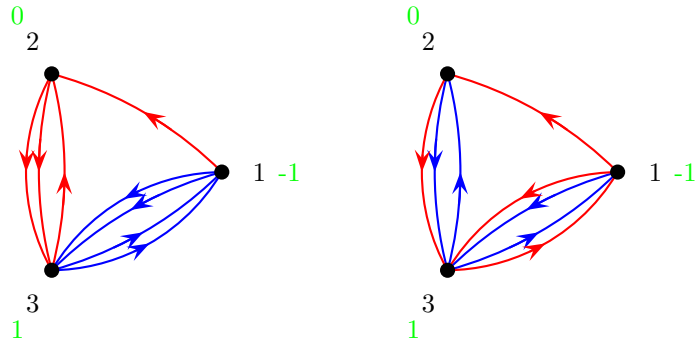


Move Graph

32121 13232 12132 32321

$$-x_{3,2,1,2,1} * x_{1,3,2,3,2} + x_{1,2,1,3,2} * x_{3,2,3,2,1}$$

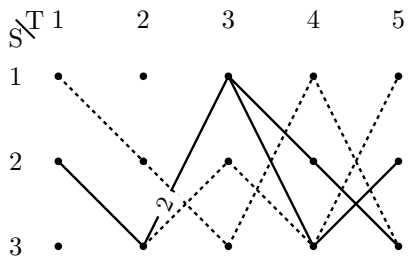
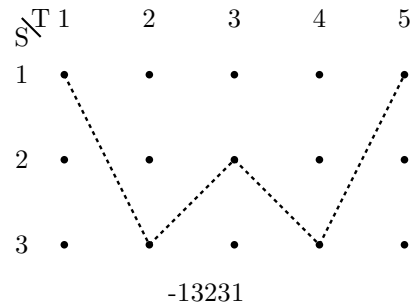
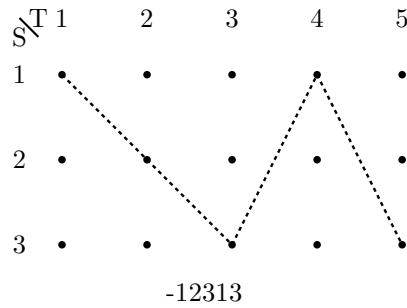
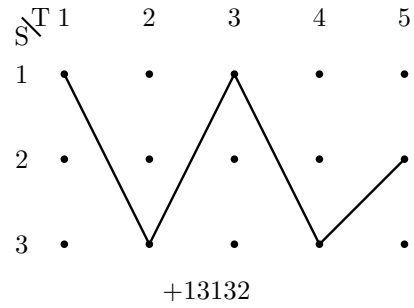
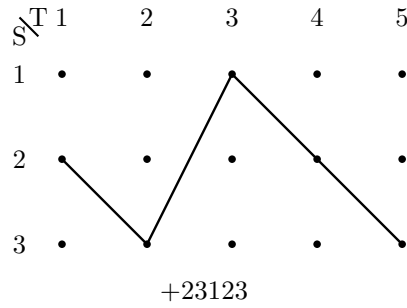
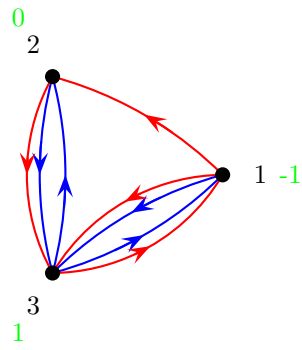
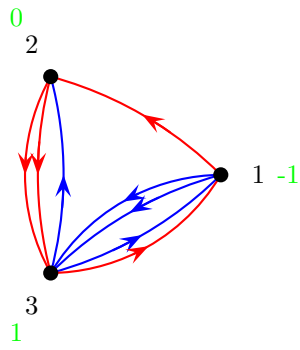
Orbit Size 3



Move Graph

$$12323 \ 13131 \ 12313 \ 13231$$

$$-x_{1,2,3,2,3} * x_{1,3,1,3,1} + x_{1,2,3,1,3} * x_{1,3,2,3,1}$$

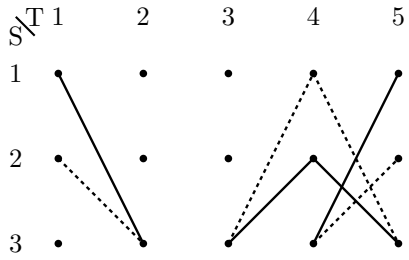
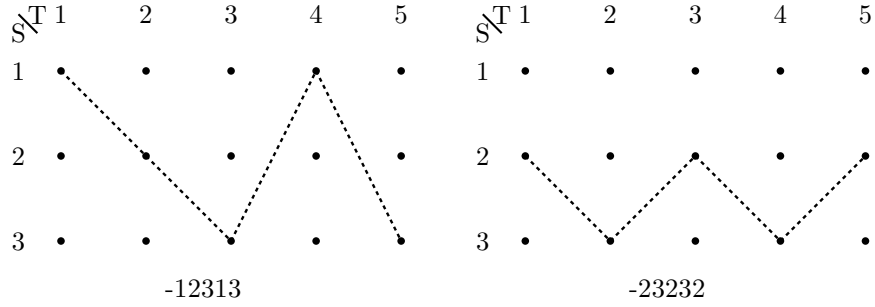
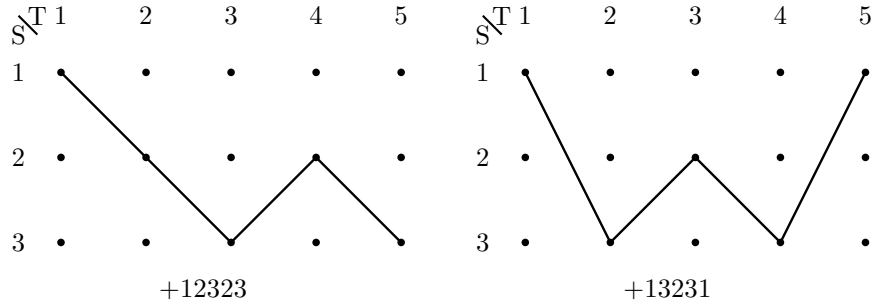
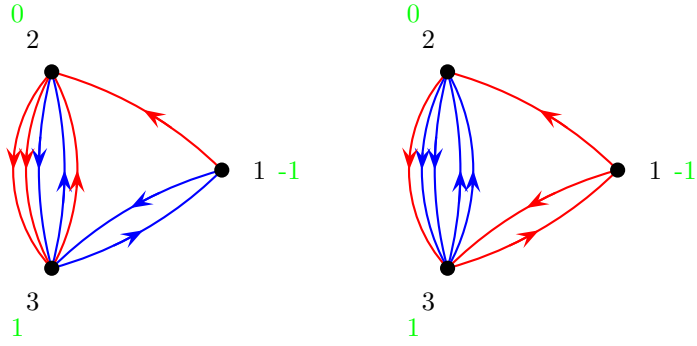


Move Graph

$$23123 \ 13132 \ 12313 \ 13231$$

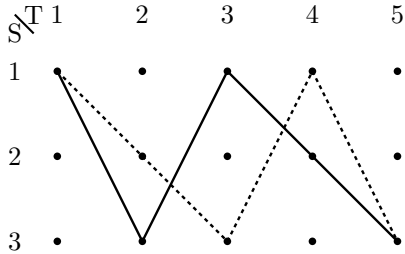
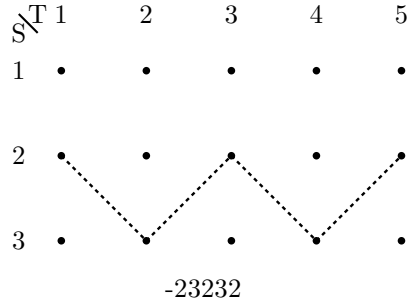
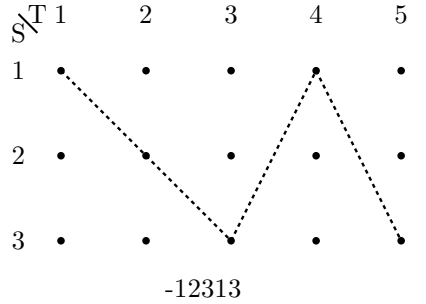
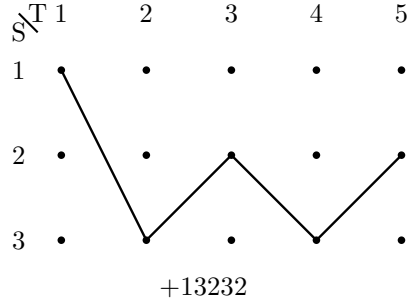
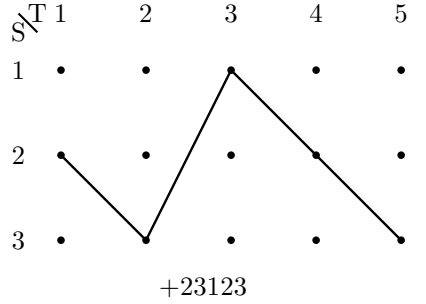
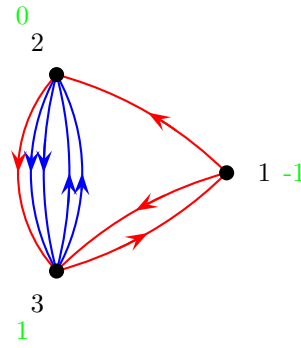
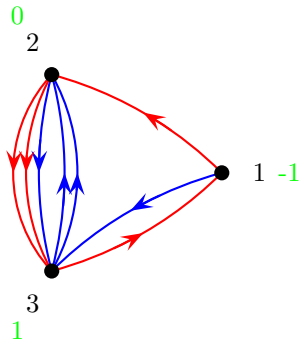
$$-x_{2,3,1,2,3} * x_{1,3,1,3,2} + x_{1,2,3,1,3} * x_{1,3,2,3,1}$$

Orbit Size 3



Move Graph

12323 13231 12313 23232
 $-x_{1,2,3,2,3} * x_{1,3,2,3,1} + x_{1,2,3,1,3} * x_{2,3,2,3,2}$

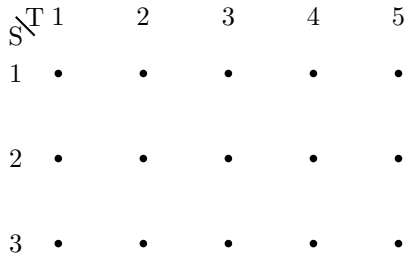
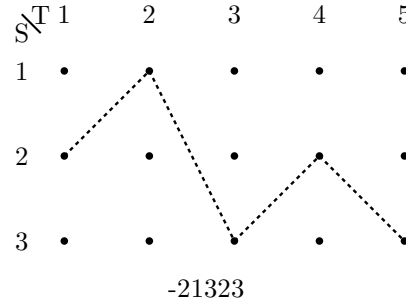
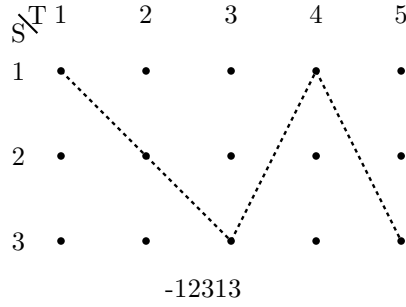
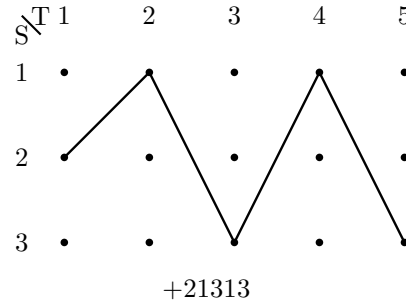
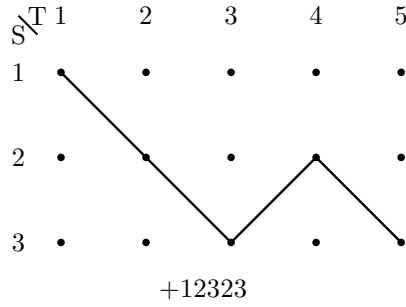
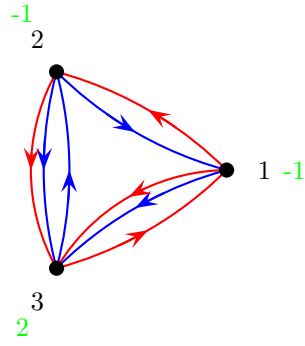
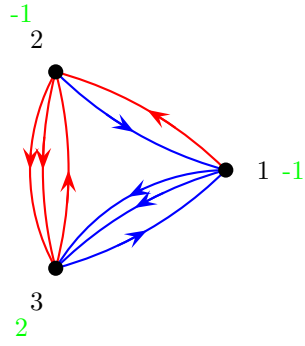


Move Graph

23123 13232 12313 23232

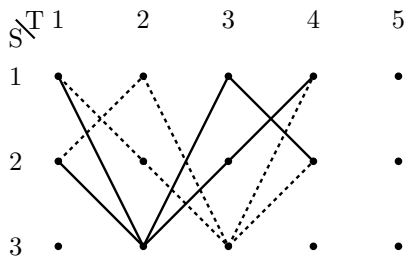
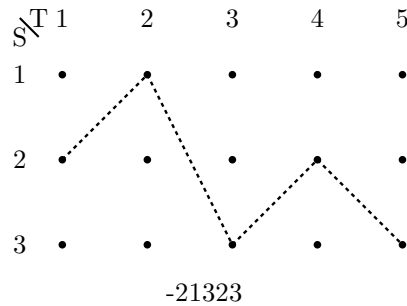
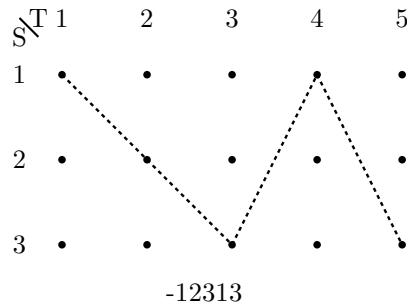
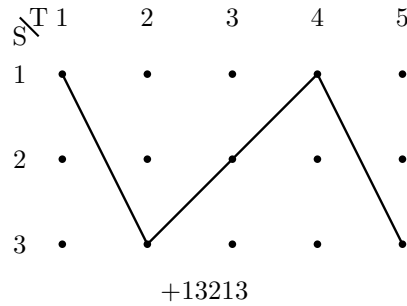
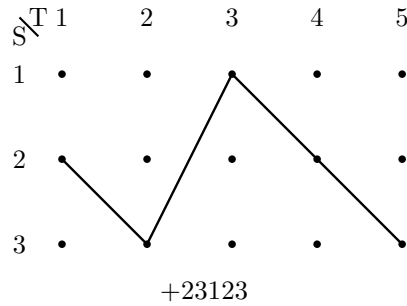
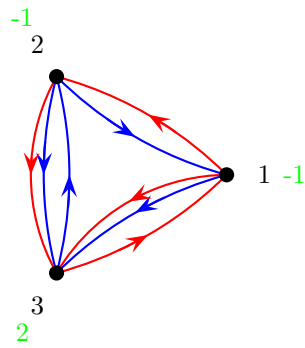
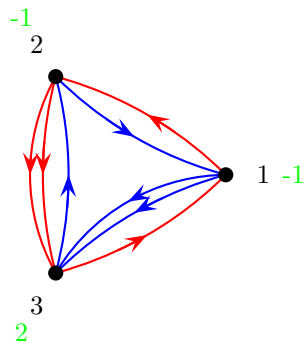
$$-x_{2,3,1,2,3} * x_{1,3,2,3,2} + x_{1,2,3,1,3} * x_{2,3,2,3,2}$$

Orbit Size 3



Move Graph

12323 21313 12313 21323
 $-x_{1,2,3,2,3} * x_{2,1,3,1,3} + x_{1,2,3,1,3} * x_{2,1,3,2,3}$

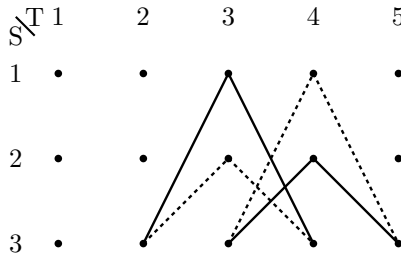
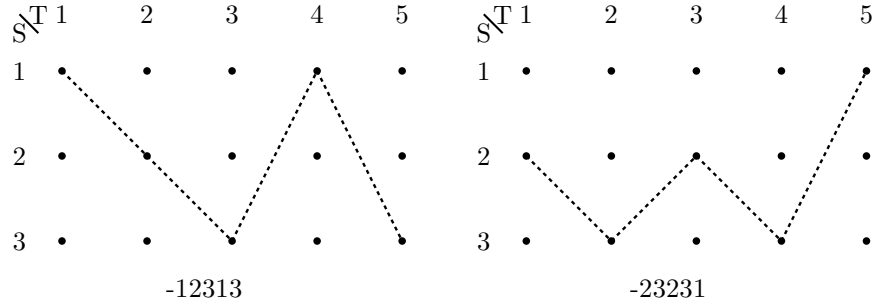
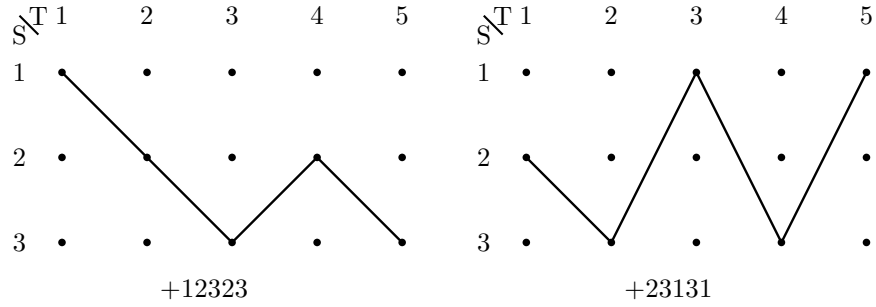
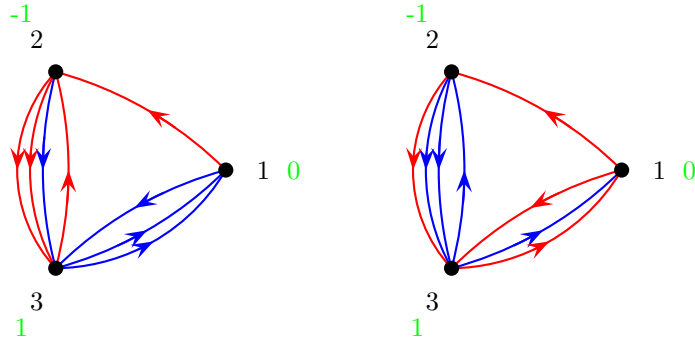


Move Graph

23123 13213 12313 21323

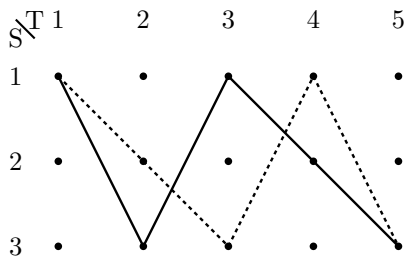
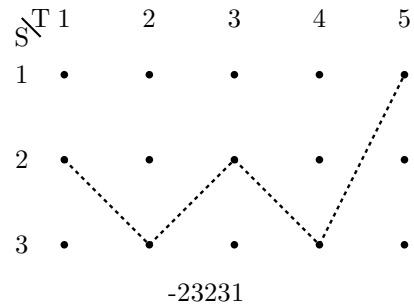
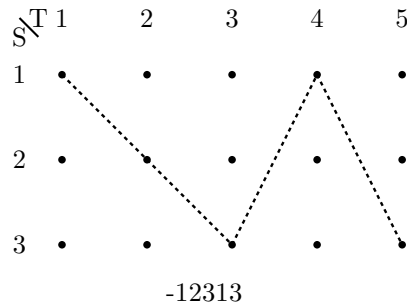
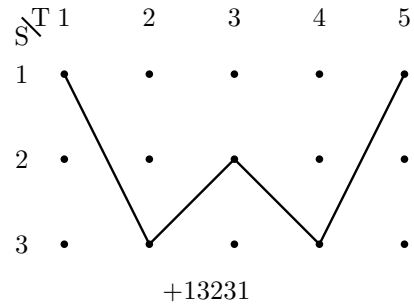
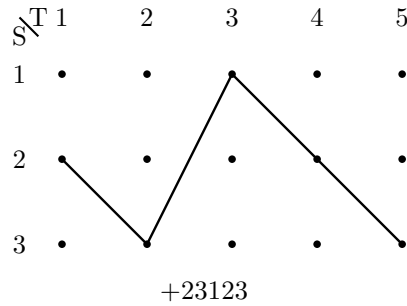
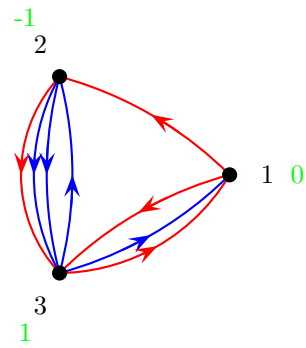
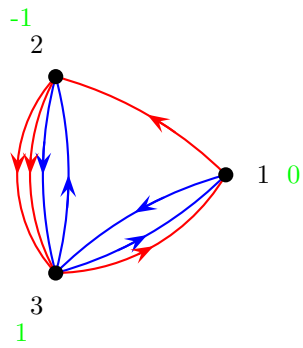
$$-x_{2,3,1,2,3} * x_{1,3,2,1,3} + x_{1,2,3,1,3} * x_{2,1,3,2,3}$$

Orbit Size 3



Move Graph

$12323 \ 23131 \ 12313 \ 23231$
 $-x_{1,2,3,2,3} * x_{2,3,1,3,1} + x_{1,2,3,1,3} * x_{2,3,2,3,1}$

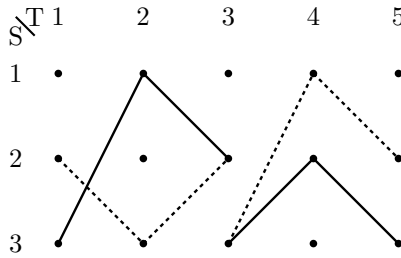
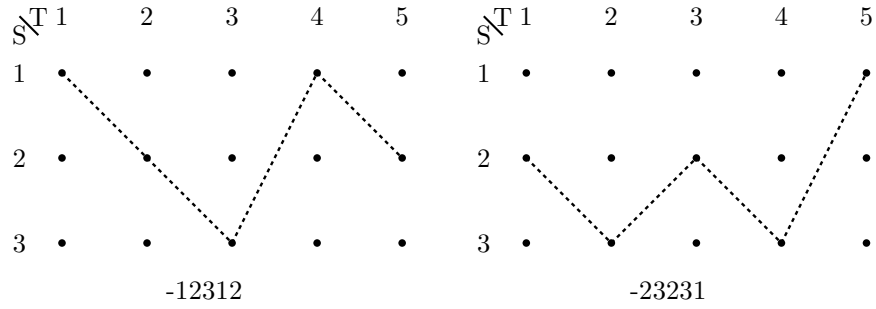
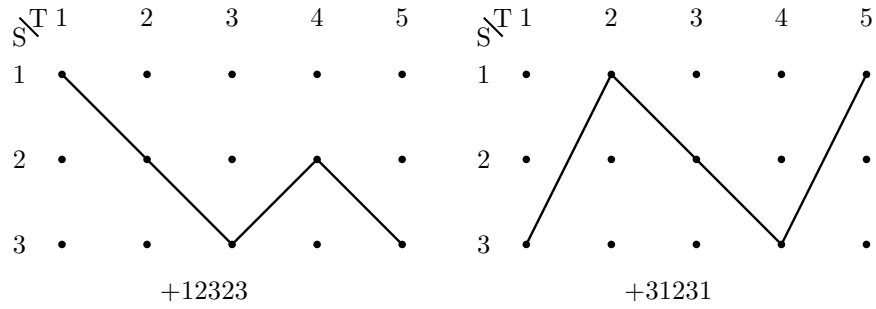
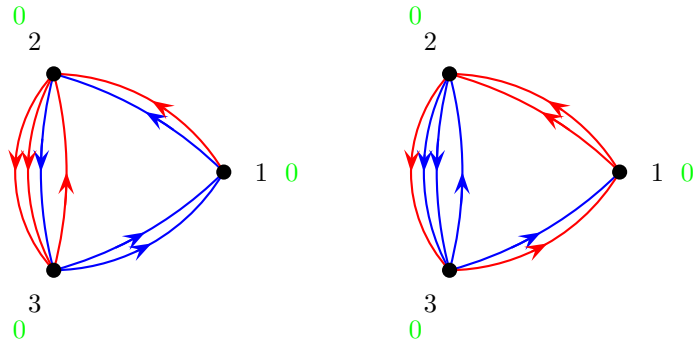


Move Graph

$$23123 \ 13231 \ 12313 \ 23231$$

$$-x_{2,3,1,2,3} * x_{1,3,2,3,1} + x_{1,2,3,1,3} * x_{2,3,2,3,1}$$

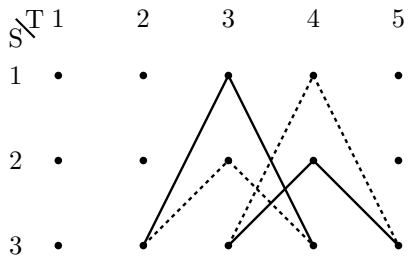
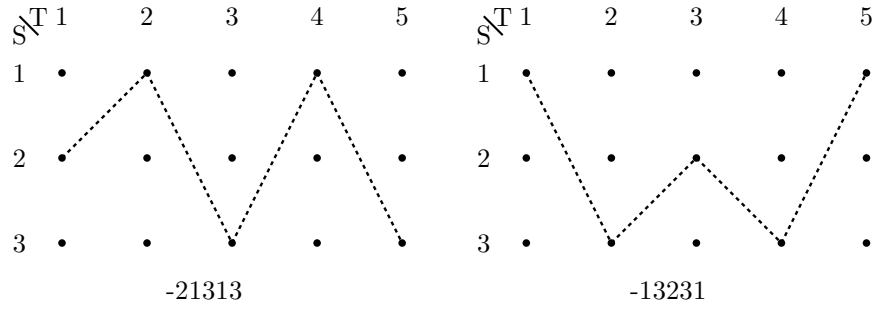
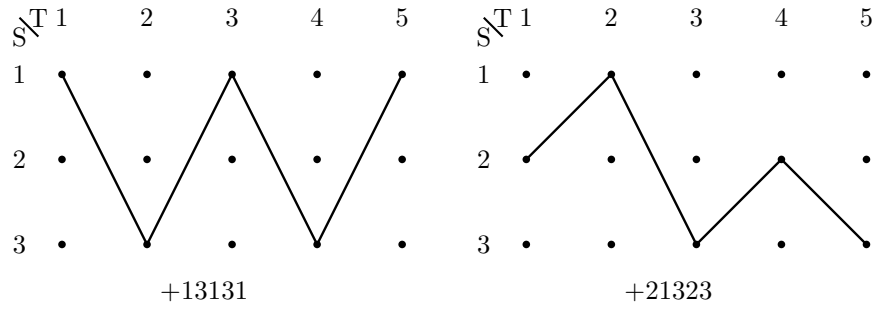
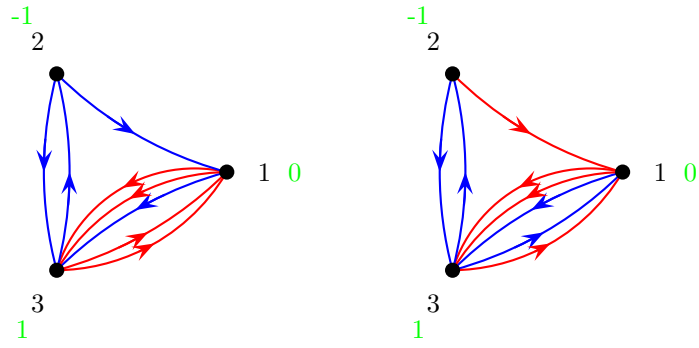
Orbit Size 3



Move Graph

$12323 \ 31231 \ 12312 \ 23231$
 $-x_{1,2,3,2,3} * x_{3,1,2,3,1} + x_{1,2,3,1,2} * x_{2,3,2,3,1}$

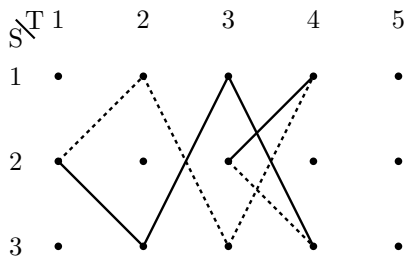
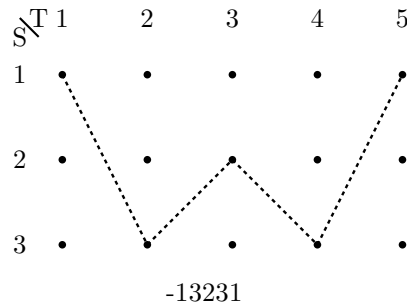
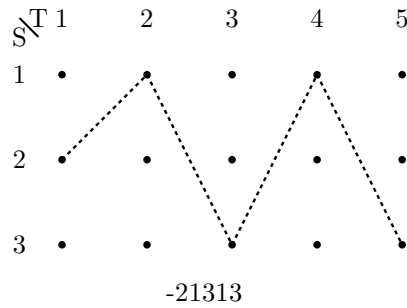
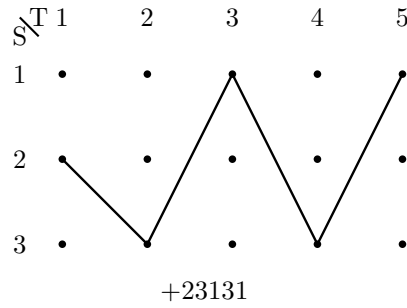
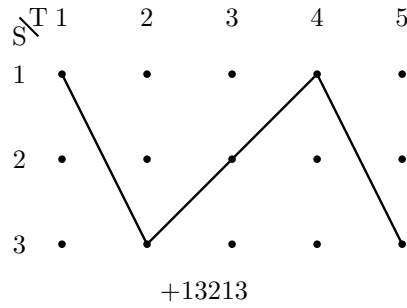
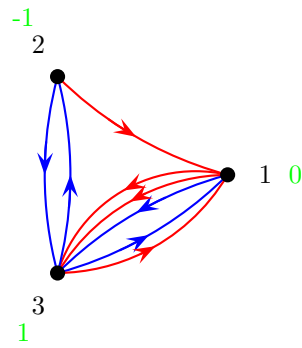
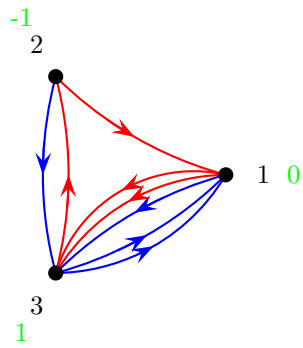
Orbit Size 3



Move Graph

$$13131 \ 21323 \ 21313 \ 13231$$

$$-x_{1,3,1,3,1} * x_{2,1,3,2,3} + x_{2,1,3,1,3} * x_{1,3,2,3,1}$$

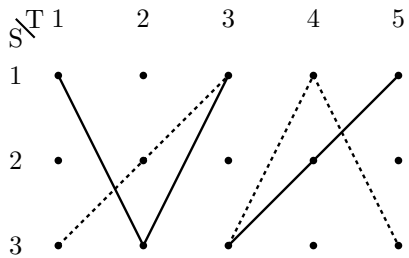
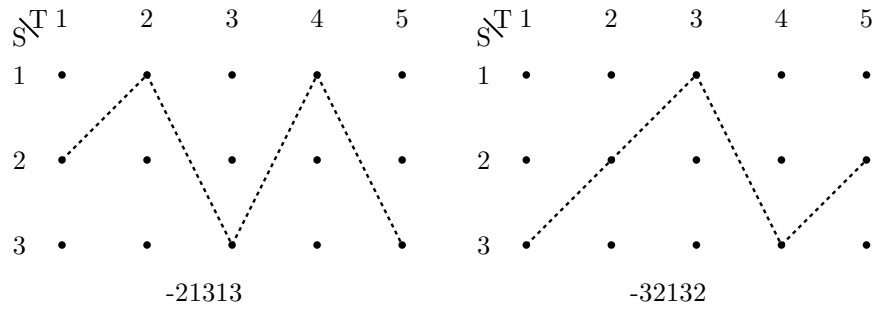
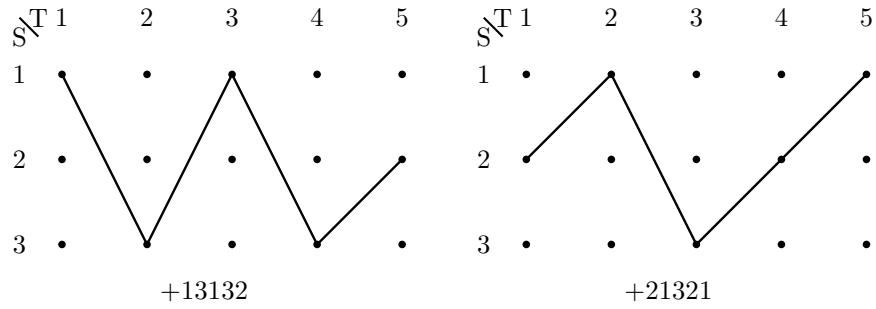
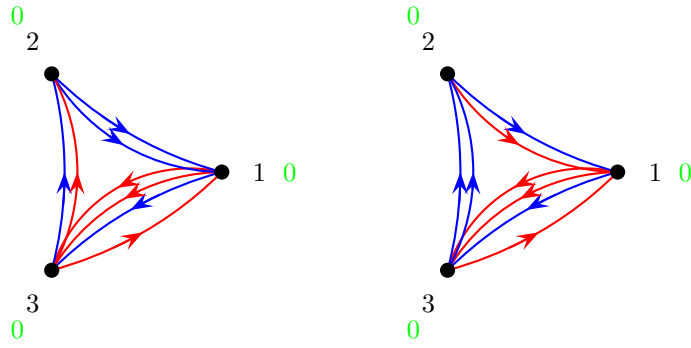


Move Graph

$$13213 \quad 23131 \quad 21313 \quad 13231$$

$$-x_{1,3,2,1,3} * x_{2,3,1,3,1} + x_{2,1,3,1,3} * x_{1,3,2,3,1}$$

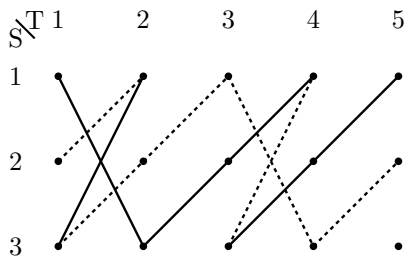
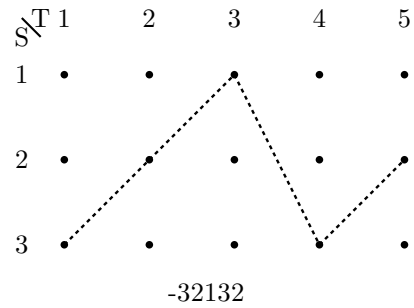
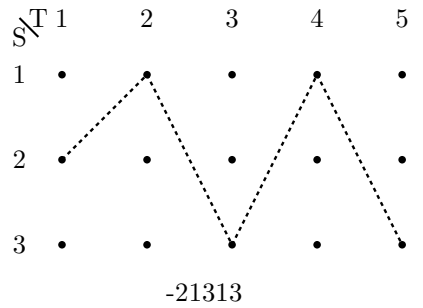
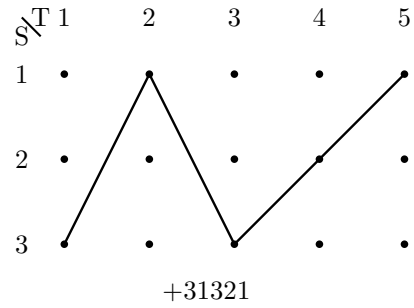
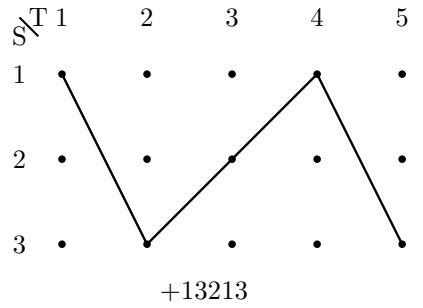
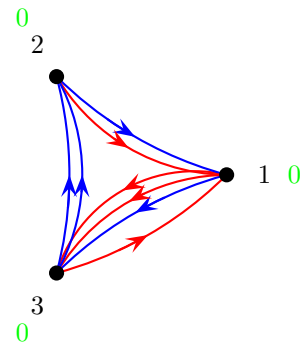
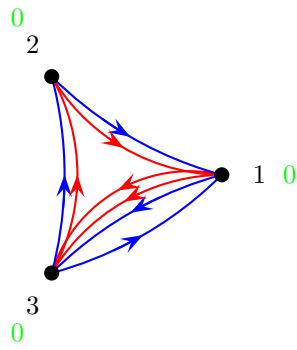
Orbit Size 3



Move Graph

$$13132 \ 21321 \ 21313 \ 32132$$

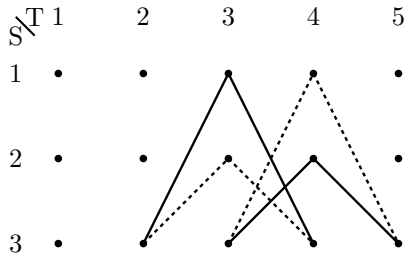
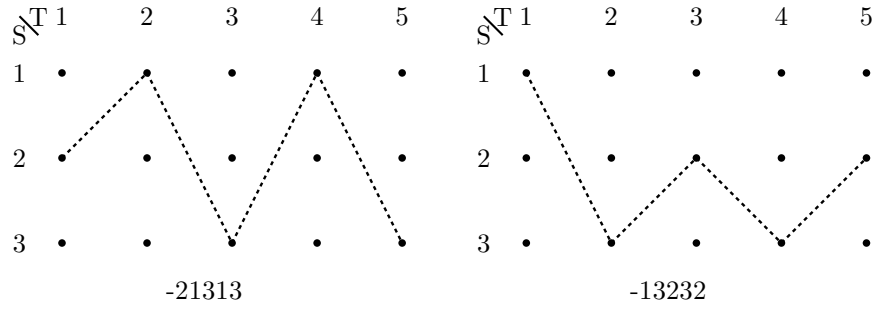
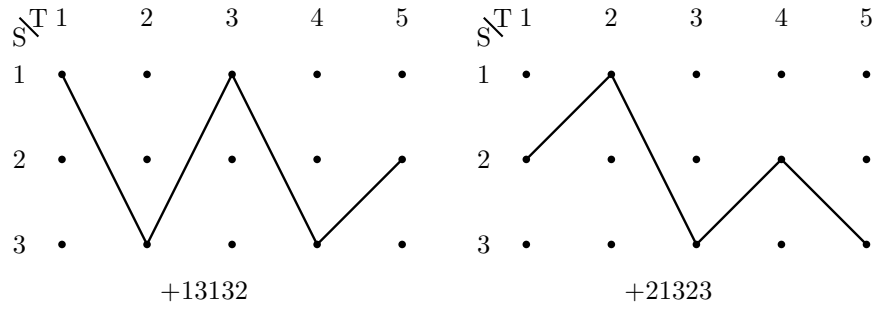
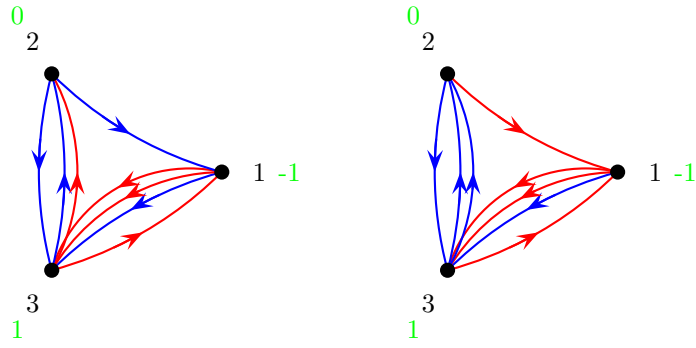
$$-x_{1,3,1,3,2} * x_{2,1,3,2,1} + x_{2,1,3,1,3} * x_{3,2,1,3,2}$$



Move Graph

13213 31321 21313 32132
 $-x_{1,3,2,1,3} * x_{3,1,3,2,1} + x_{2,1,3,1,3} * x_{3,2,1,3,2}$

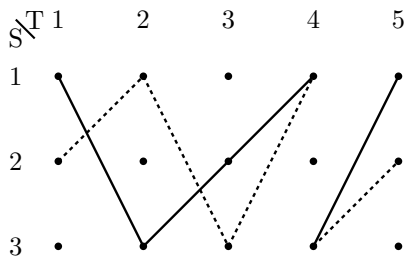
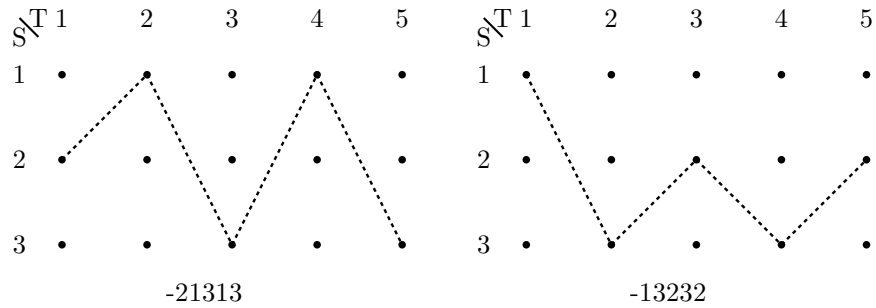
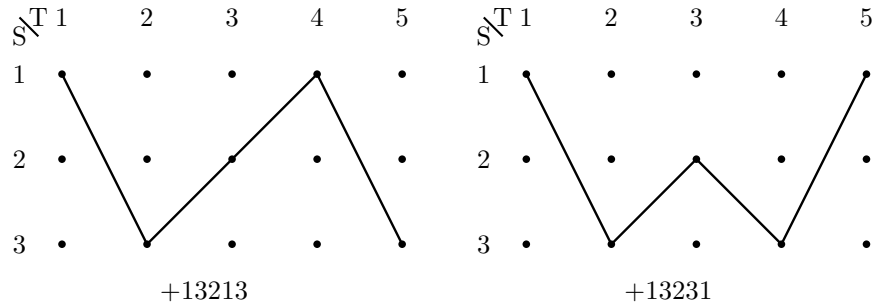
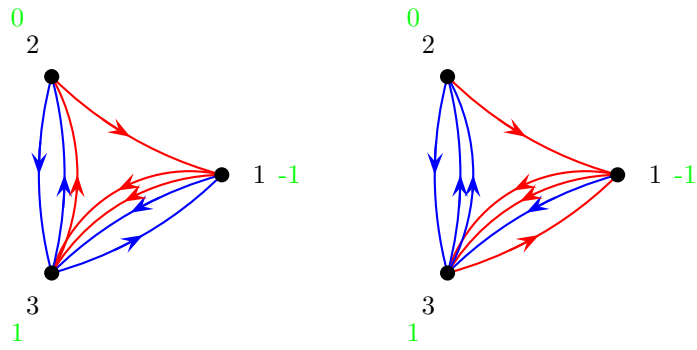
Orbit Size 3



Move Graph

$$13132 \ 21323 \ 21313 \ 13232$$

$$-x_{1,3,1,3,2} * x_{2,1,3,2,3} + x_{2,1,3,1,3} * x_{1,3,2,3,2}$$

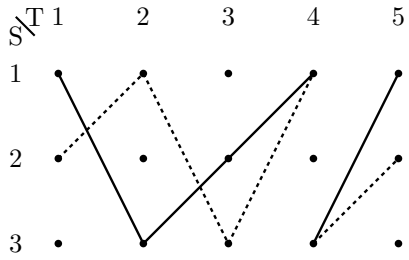
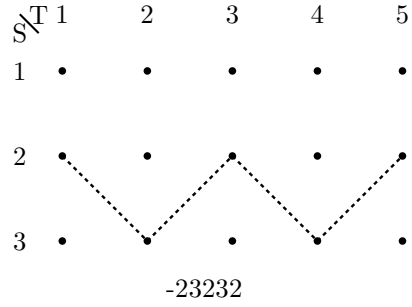
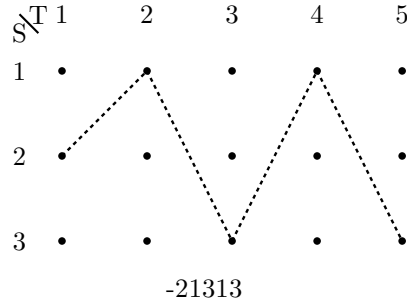
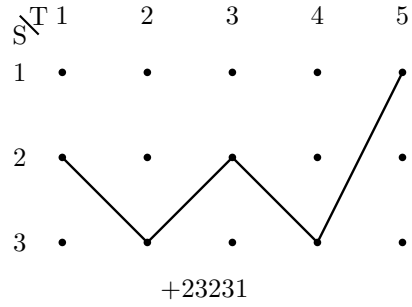
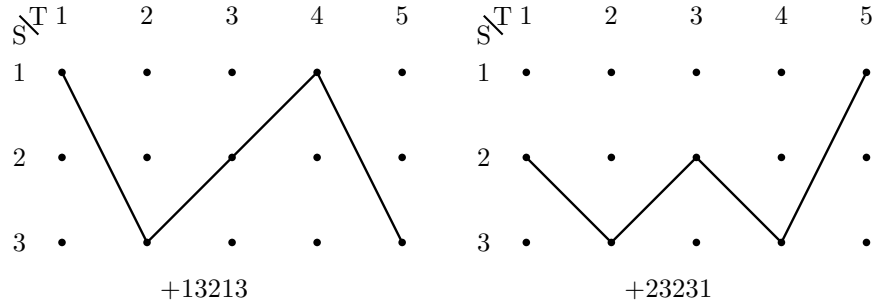
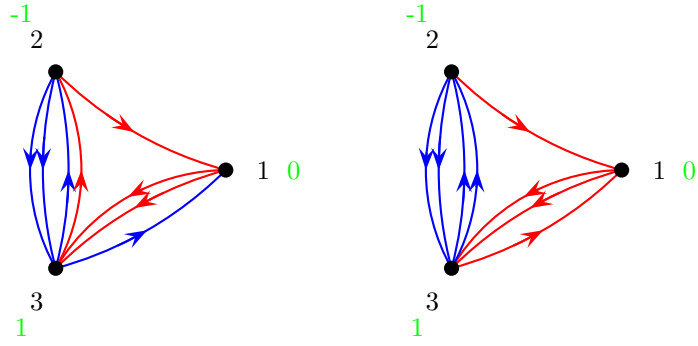


Move Graph

$$13213 \ 13231 \ 21313 \ 13232$$

$$-x_{1,3,2,1,3} * x_{1,3,2,3,1} + x_{2,1,3,1,3} * x_{1,3,2,3,2}$$

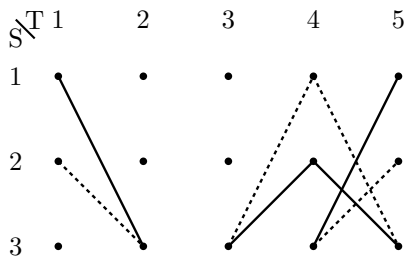
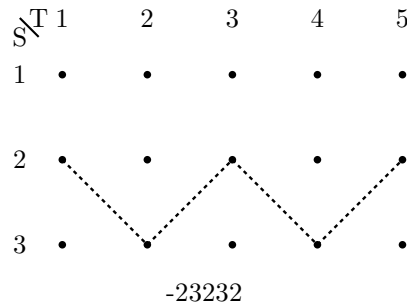
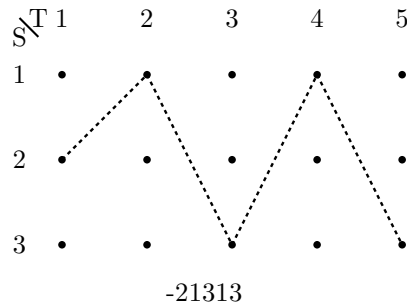
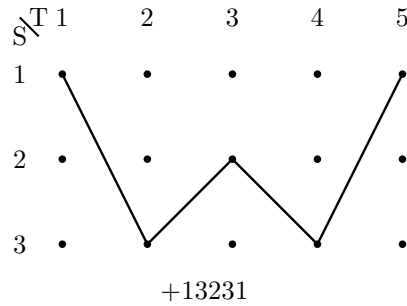
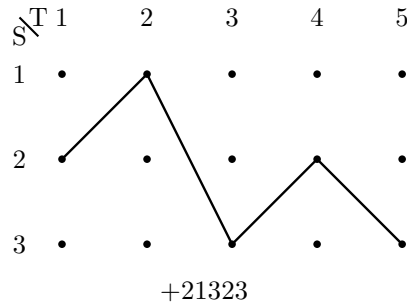
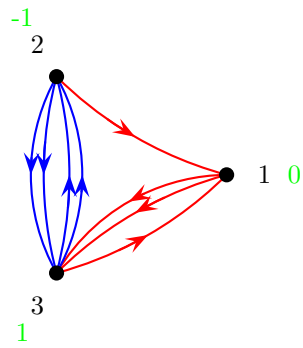
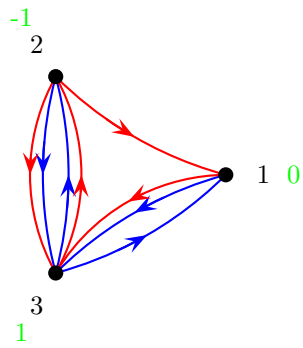
Orbit Size 3



Move Graph

$$13213 \ 23231 \ 21313 \ 23232$$

$$-x_{1,3,2,1,3} * x_{2,3,2,3,1} + x_{2,1,3,1,3} * x_{2,3,2,3,2}$$

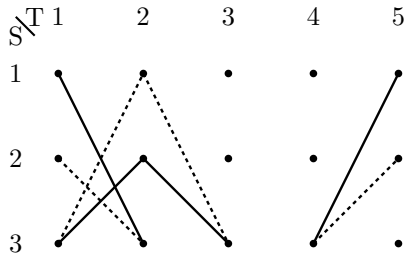
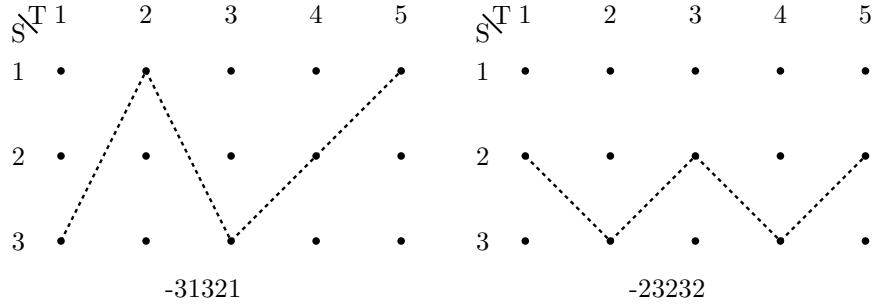
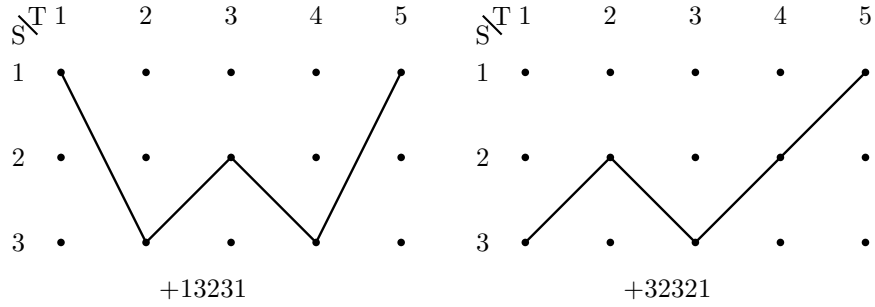
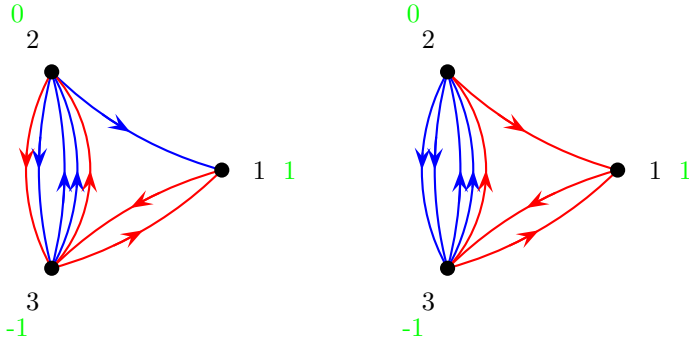


Move Graph

21323 13231 21313 23232

$$-x_{2,1,3,2,3} * x_{1,3,2,3,1} + x_{2,1,3,1,3} * x_{2,3,2,3,2}$$

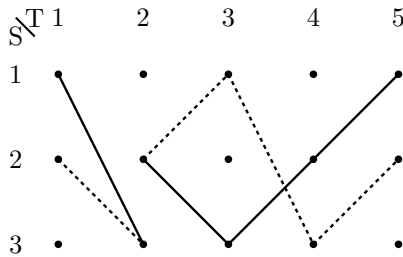
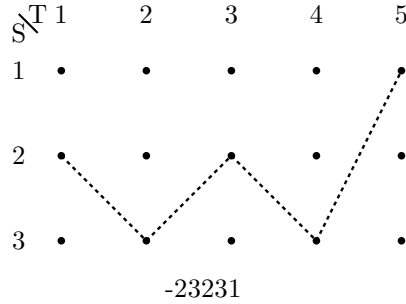
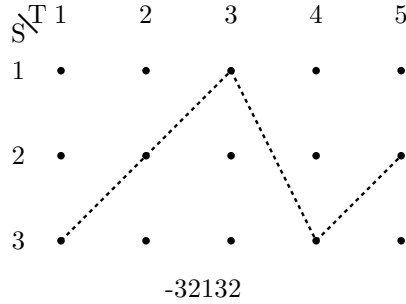
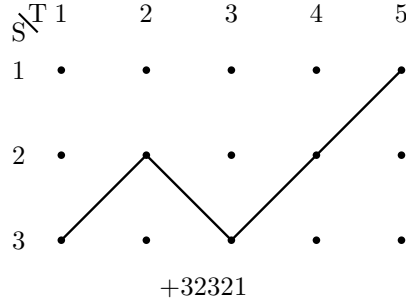
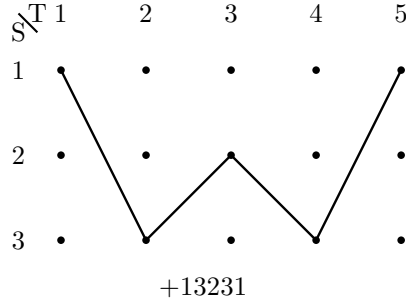
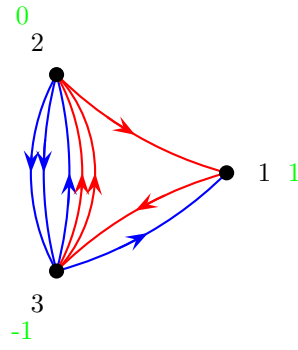
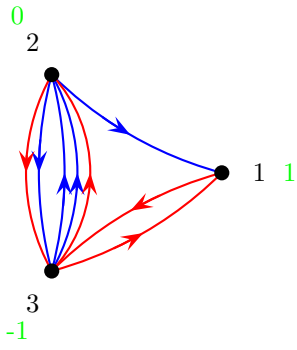
Orbit Size 3



Move Graph

$$13231 \ 32321 \ 31321 \ 23232$$

$$-x_{1,3,2,3,1} * x_{3,2,3,2,1} + x_{3,1,3,2,1} * x_{2,3,2,3,2}$$

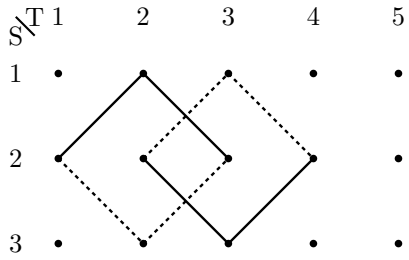
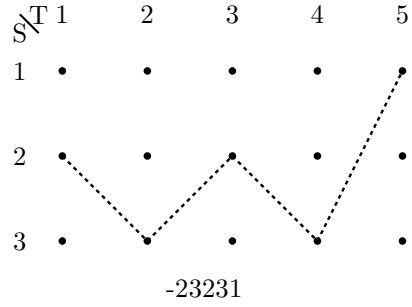
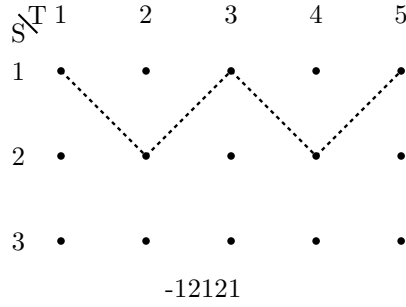
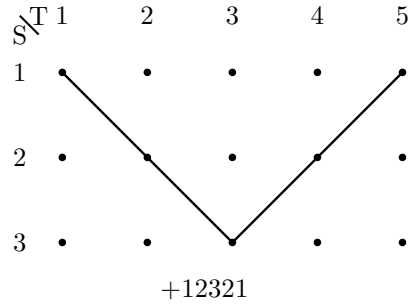
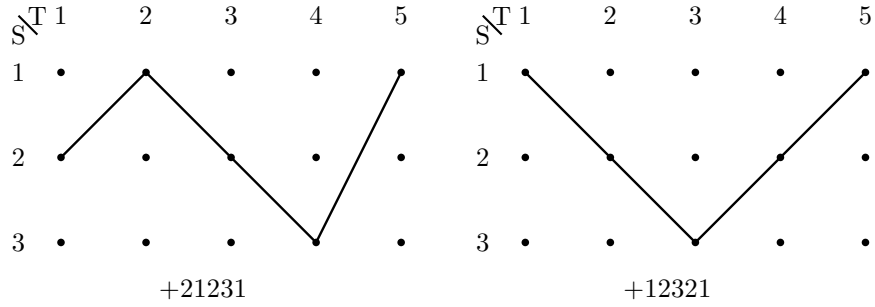
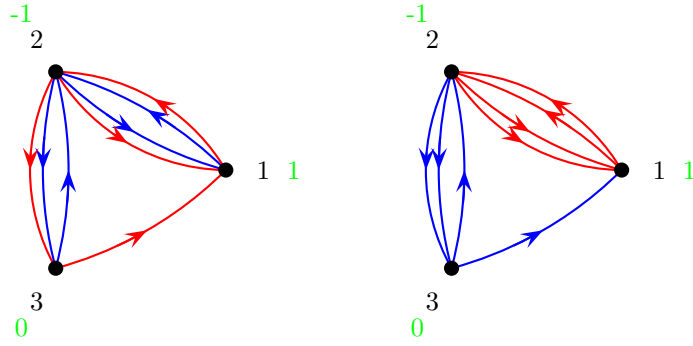


Move Graph

13231 32321 32132 23231

$$-x_{1,3,2,3,1} * x_{3,2,3,2,1} + x_{3,2,1,3,2} * x_{2,3,2,3,1}$$

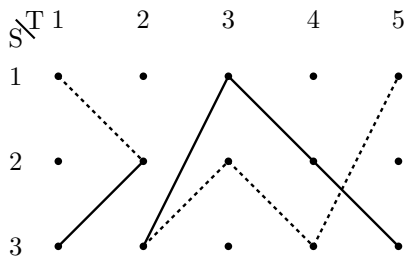
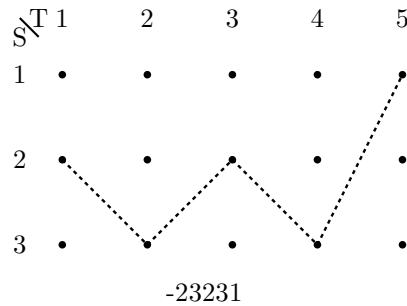
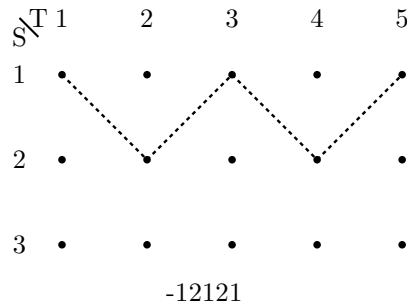
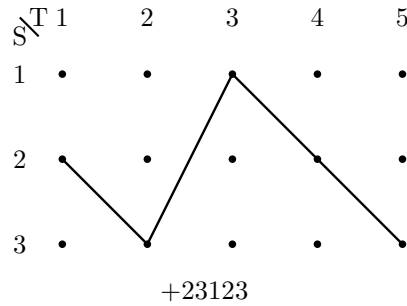
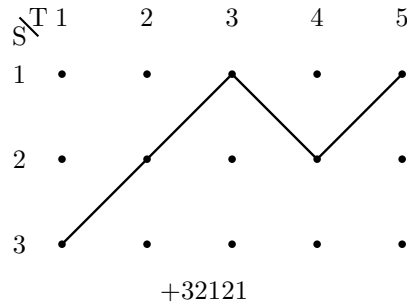
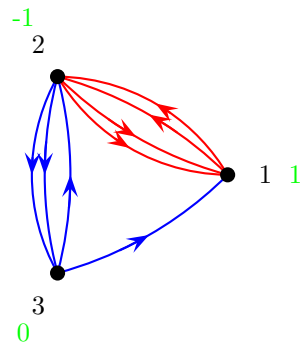
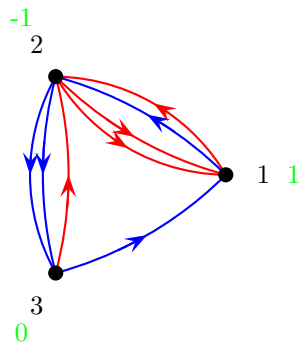
Orbit Size 3



Move Graph

$$21231 \ 12321 \ 12121 \ 23231$$

$$-x_{2,1,2,3,1} * x_{1,2,3,2,1} + x_{1,2,1,2,1} * x_{2,3,2,3,1}$$

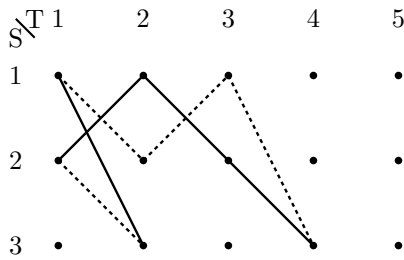
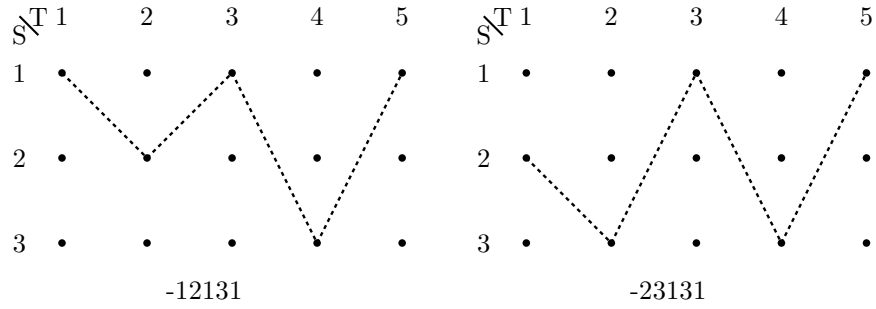
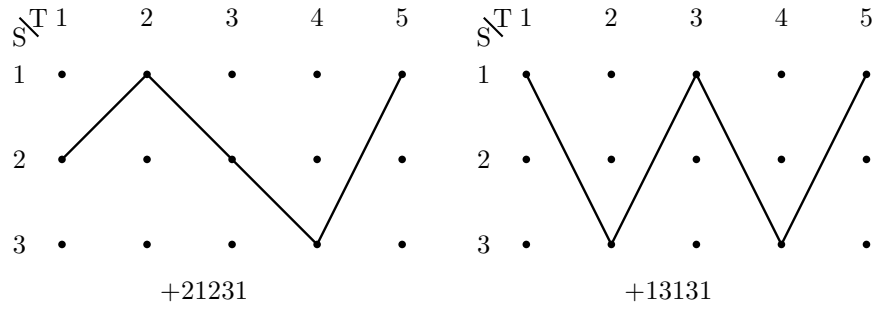
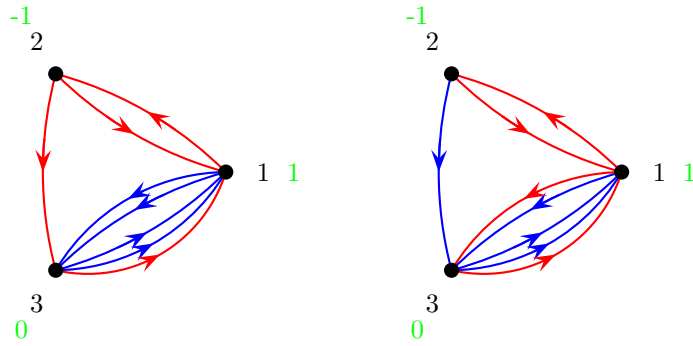


Move Graph

$$32121 \quad 23123 \quad 12121 \quad 23231$$

$$-x_{3,2,1,2,1} * x_{2,3,1,2,3} + x_{1,2,1,2,1} * x_{2,3,2,3,1}$$

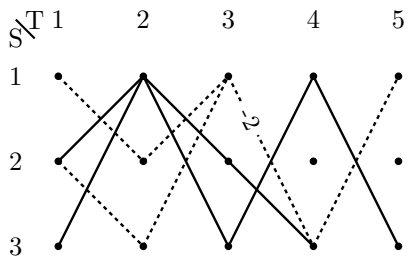
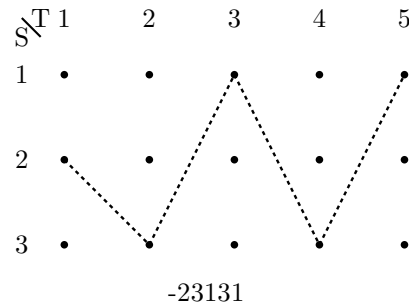
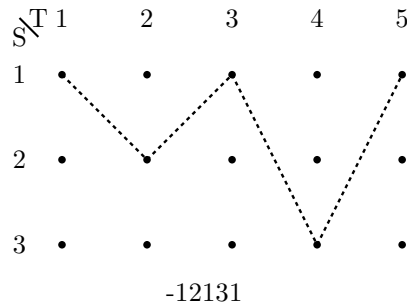
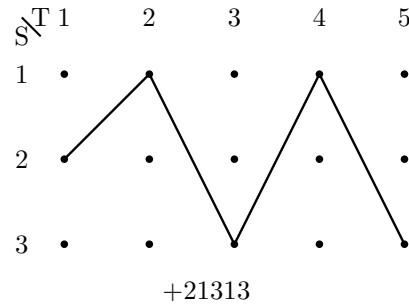
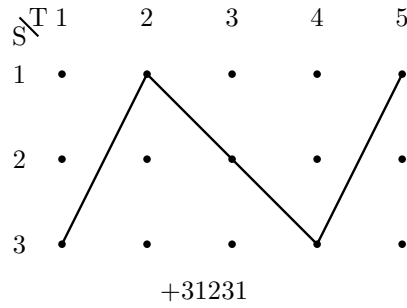
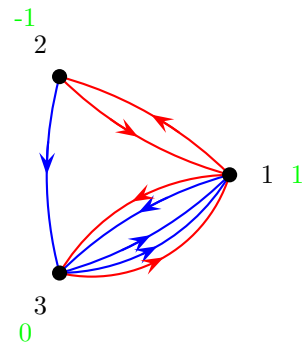
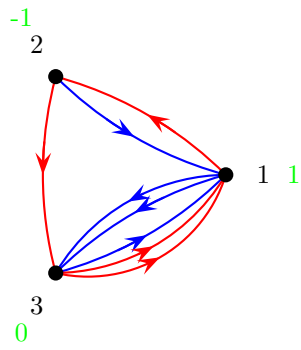
Orbit Size 3



Move Graph

$$21231 \ 13131 \ 12131 \ 23131$$

$$-x_{2,1,2,3,1} * x_{1,3,1,3,1} + x_{1,2,1,3,1} * x_{2,3,1,3,1}$$

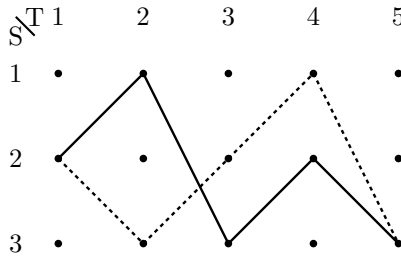
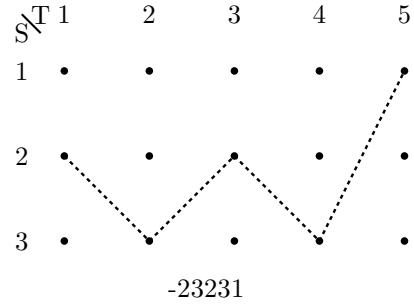
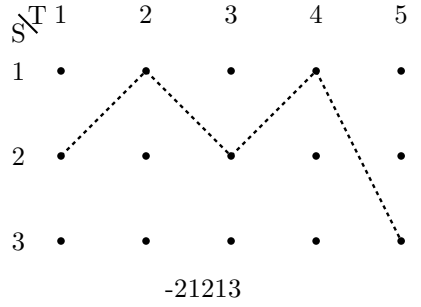
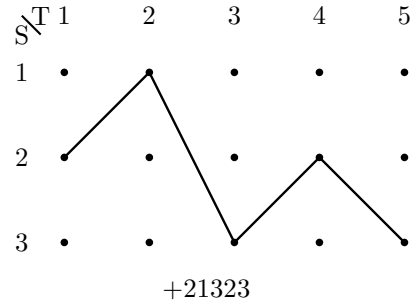
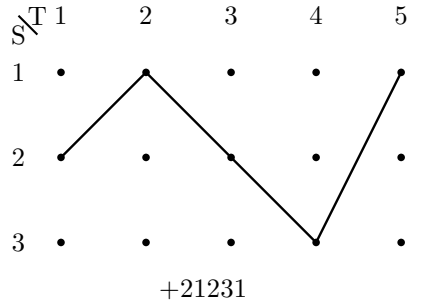
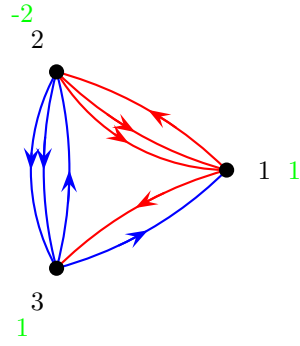
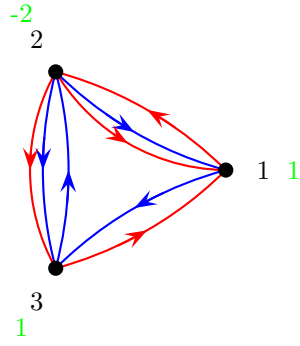


Move Graph

31231 21313 12131 23131

$$-x_{3,1,2,3,1} * x_{2,1,3,1,3} + x_{1,2,1,3,1} * x_{2,3,1,3,1}$$

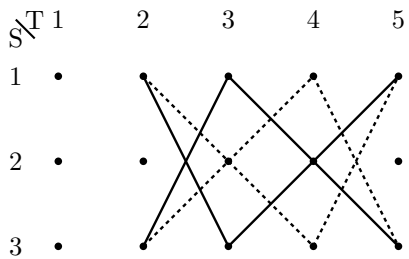
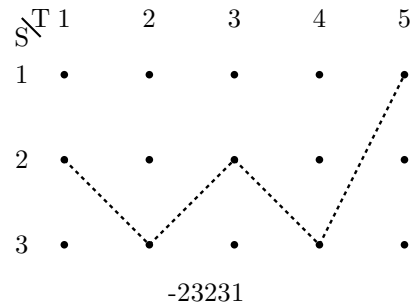
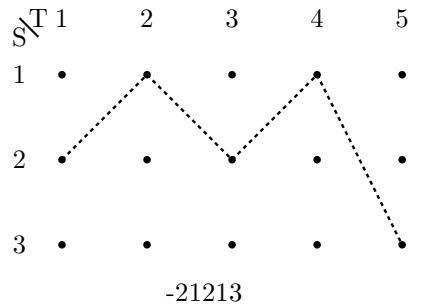
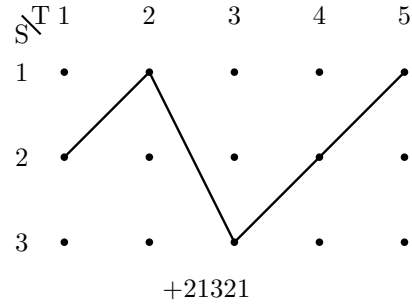
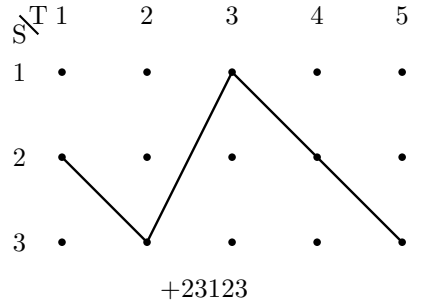
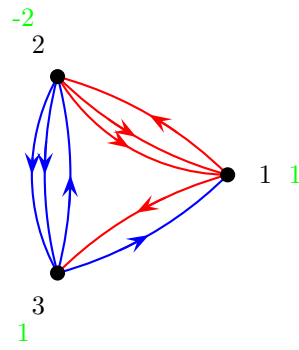
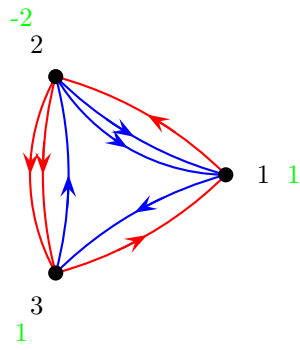
Orbit Size 3



Move Graph

$$21231 \ 21323 \ 21213 \ 23231$$

$$-x_{2,1,2,3,1} * x_{2,1,3,2,3} + x_{2,1,2,1,3} * x_{2,3,2,3,1}$$

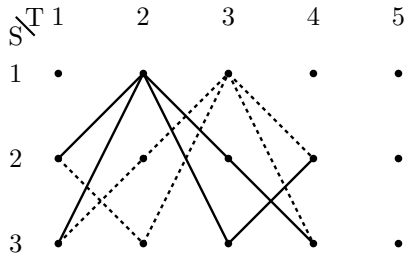
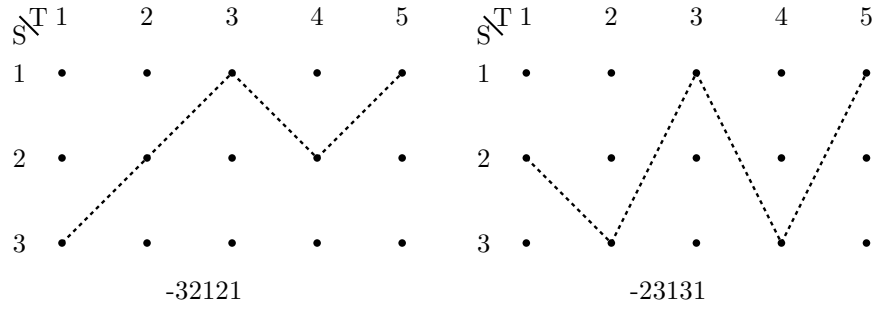
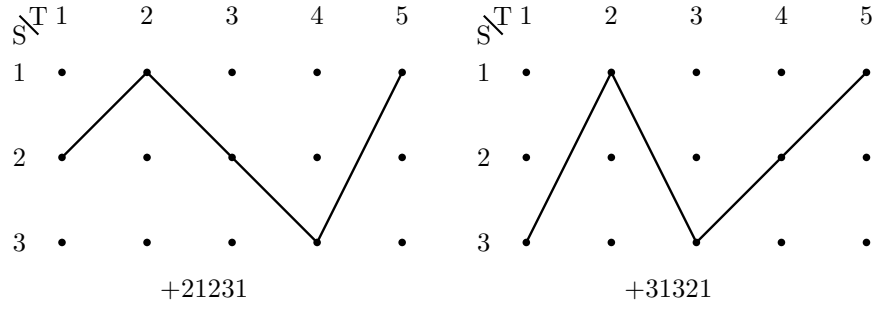
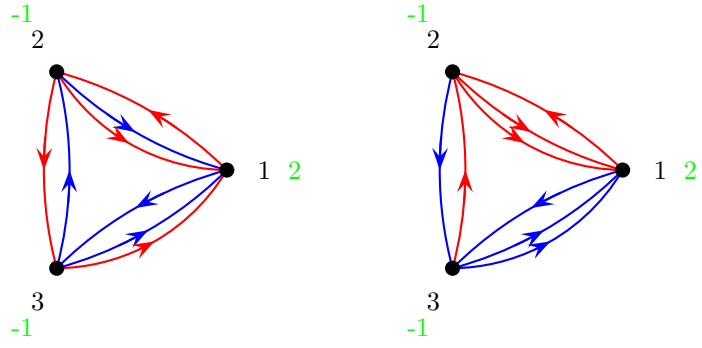


Move Graph

$$23123 \ 21321 \ 21213 \ 23231$$

$$-x_{2,3,1,2,3} * x_{2,1,3,2,1} + x_{2,1,2,1,3} * x_{2,3,2,3,1}$$

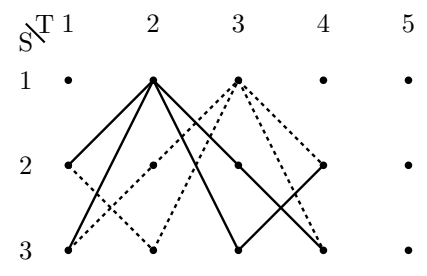
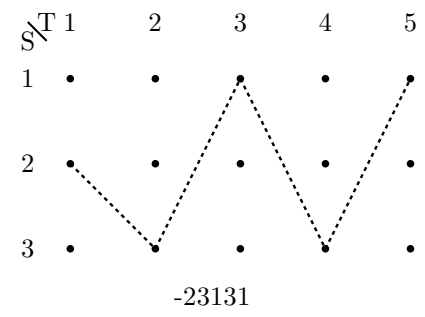
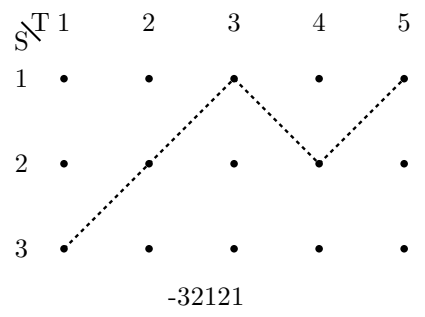
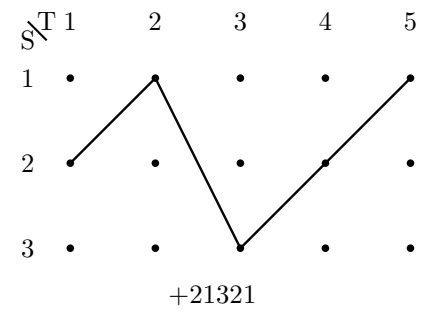
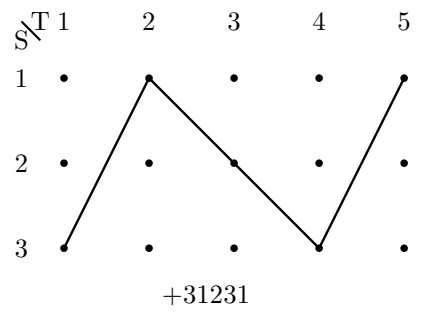
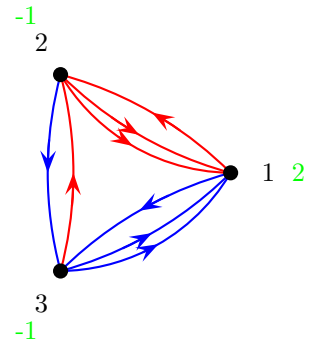
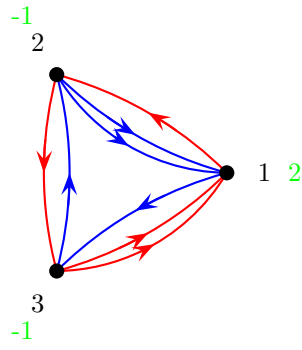
Orbit Size 3



Move Graph

$$21231 \ 31321 \ 32121 \ 23131$$

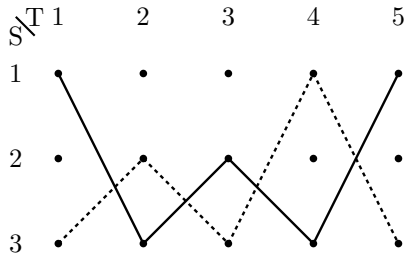
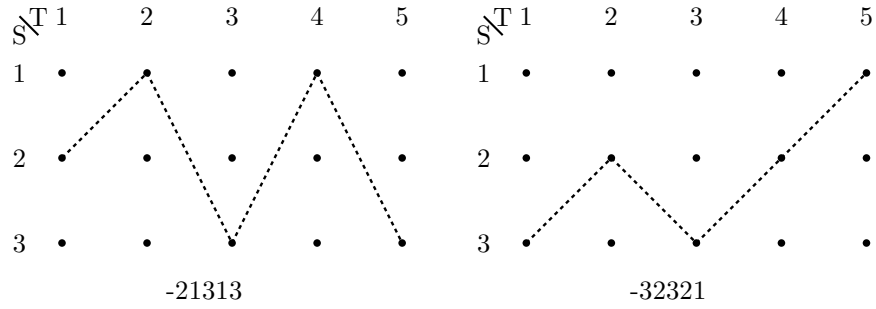
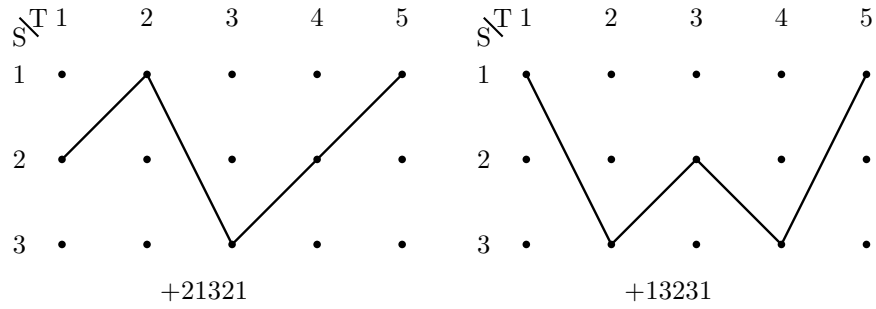
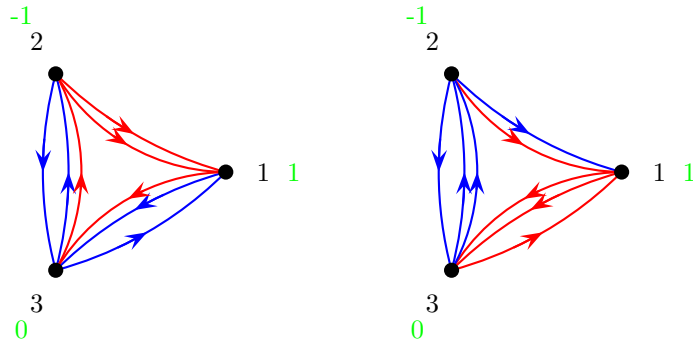
$$-x_{2,1,2,3,1} * x_{3,1,3,2,1} + x_{3,2,1,2,1} * x_{2,3,1,3,1}$$



Move Graph

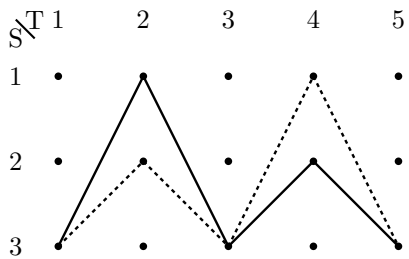
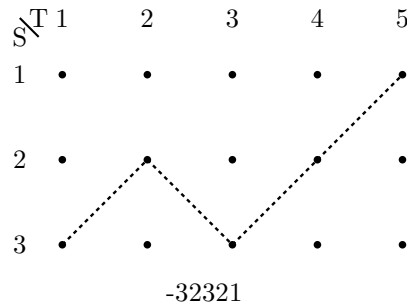
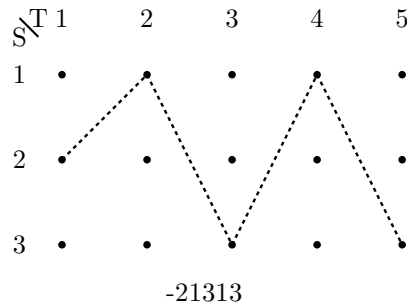
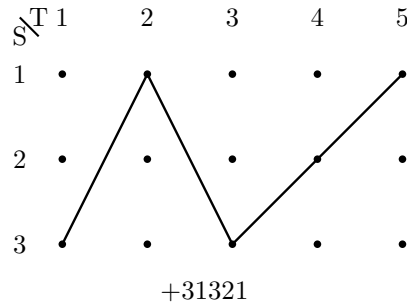
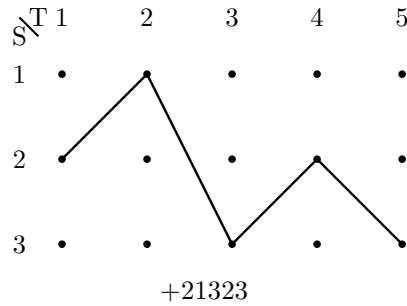
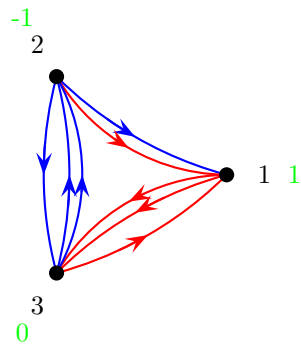
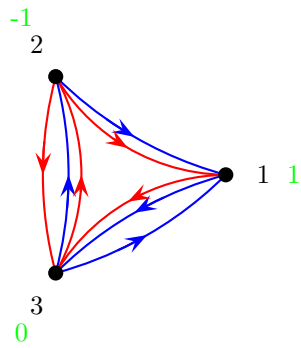
31231 21321 32121 23131
 $-x_{3,1,2,3,1} * x_{2,1,3,2,1} + x_{3,2,1,2,1} * x_{2,3,1,3,1}$

Orbit Size 3



Move Graph

$21321 \ 13231 \ 21313 \ 32321$
 $-x_{2,1,3,2,1} * x_{1,3,2,3,1} + x_{2,1,3,1,3} * x_{3,2,3,2,1}$

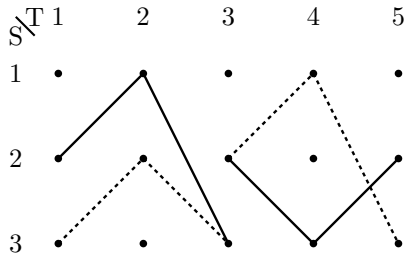
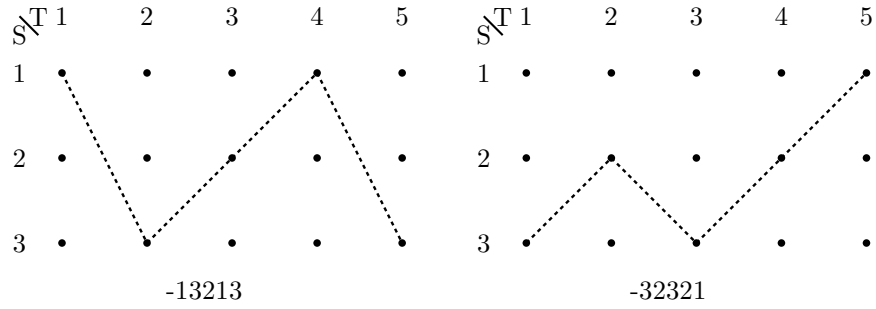
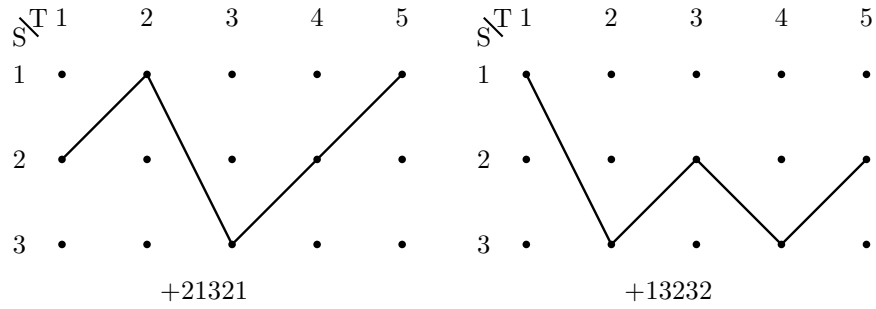
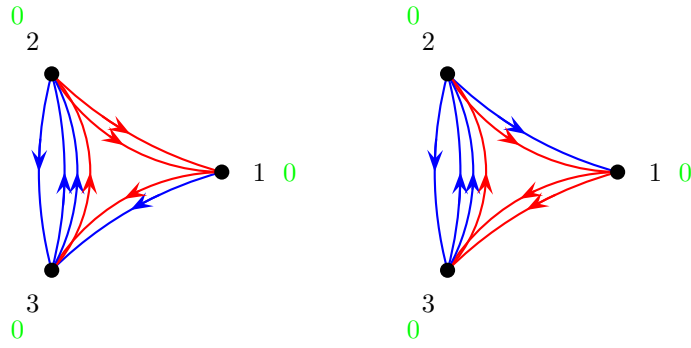


Move Graph

$$21323 \ 31321 \ 21313 \ 32321$$

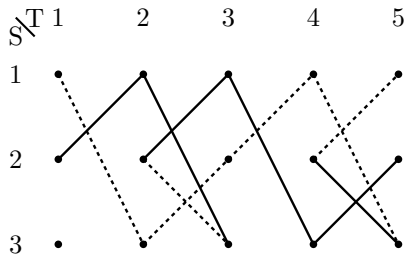
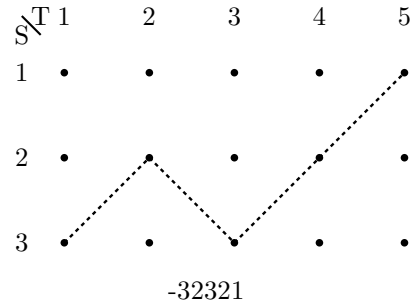
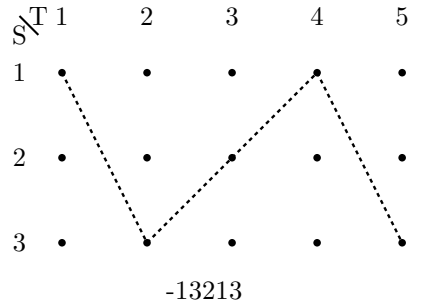
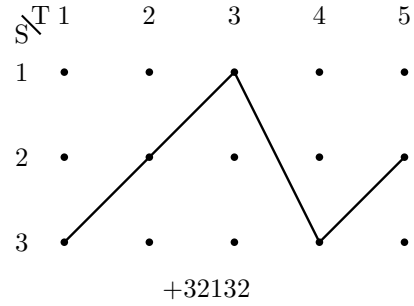
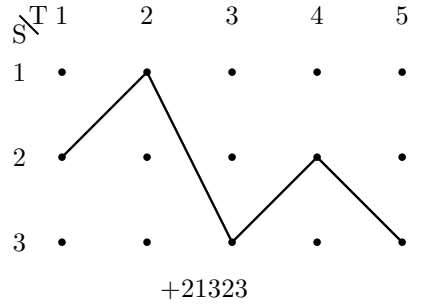
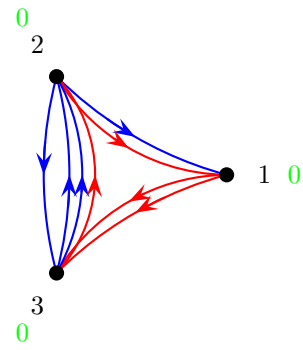
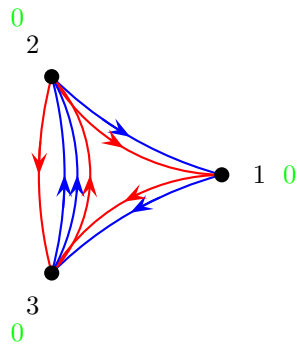
$$-x_{2,1,3,2,3} * x_{3,1,3,2,1} + x_{2,1,3,1,3} * x_{3,2,3,2,1}$$

Orbit Size 3



Move Graph

$21321 \quad 13232 \quad 13213 \quad 32321$
 $-x_{2,1,3,2,1} * x_{1,3,2,3,2} + x_{1,3,2,1,3} * x_{3,2,3,2,1}$

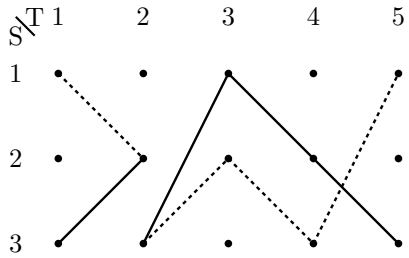
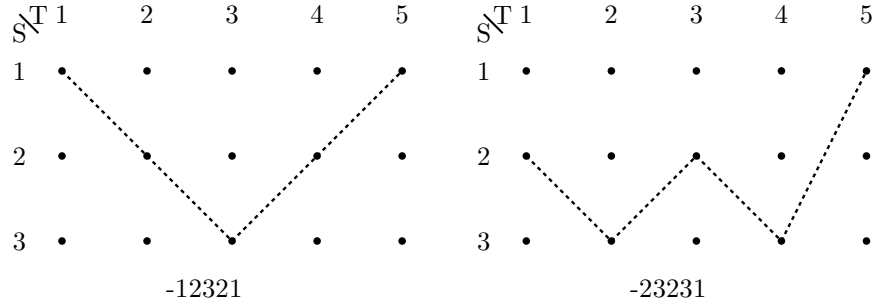
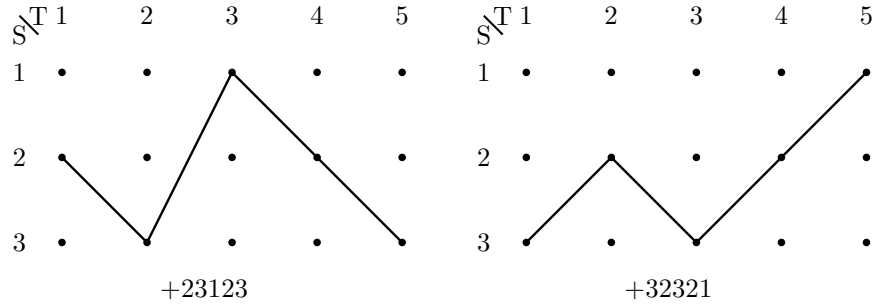
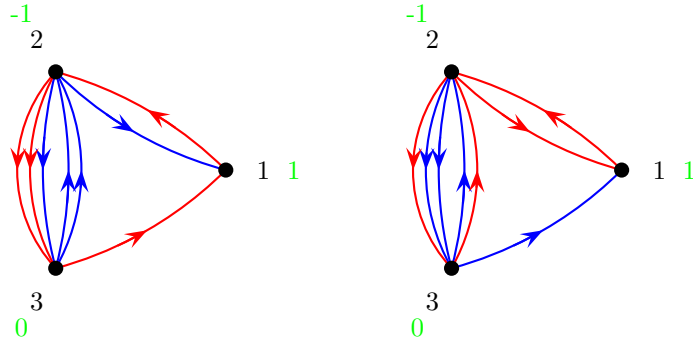


Move Graph

21323 32132 13213 32321

$$-x_{2,1,3,2,3} * x_{3,2,1,3,2} + x_{1,3,2,1,3} * x_{3,2,3,2,1}$$

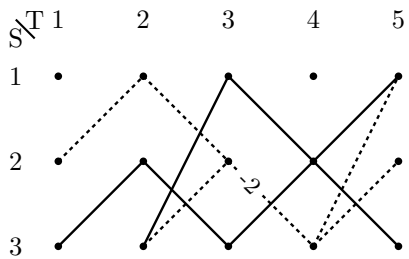
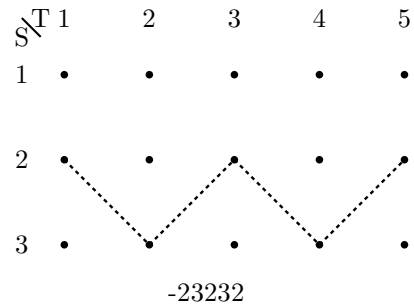
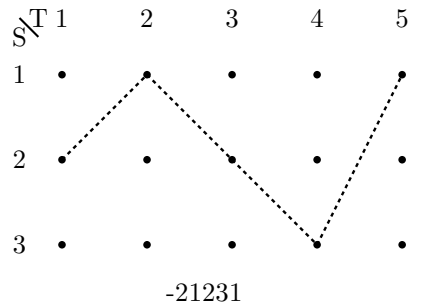
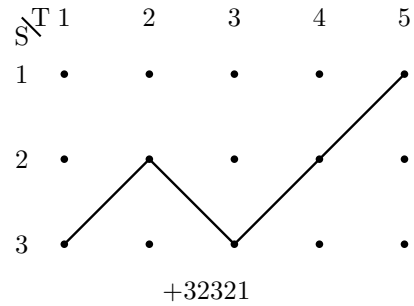
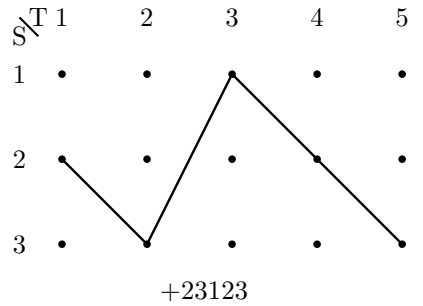
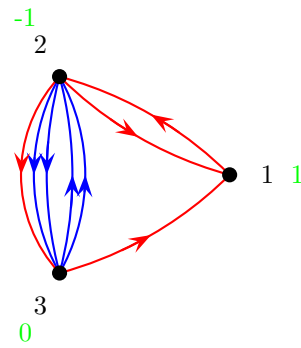
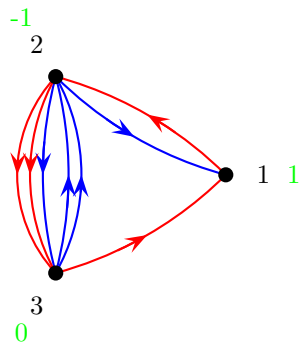
Orbit Size 3



Move Graph

$$23123 \ 32321 \ 12321 \ 23231$$

$$-x_{2,3,1,2,3} * x_{3,2,3,2,1} + x_{1,2,3,2,1} * x_{2,3,2,3,1}$$

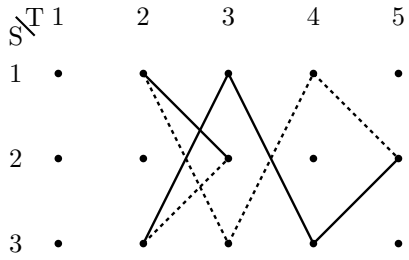
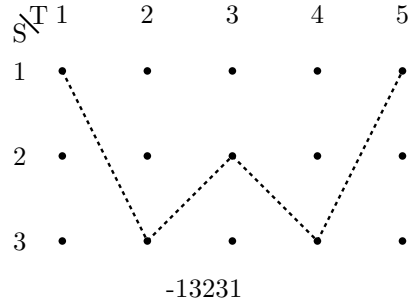
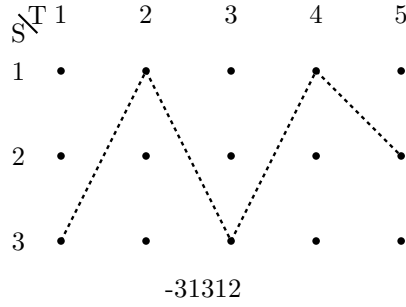
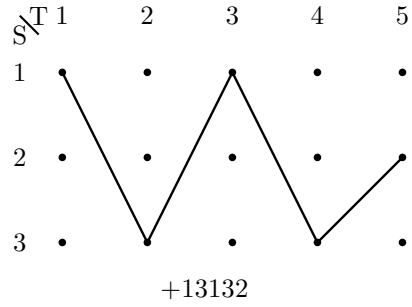
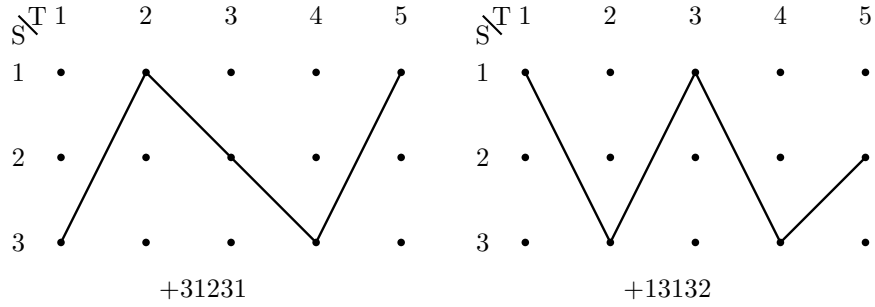
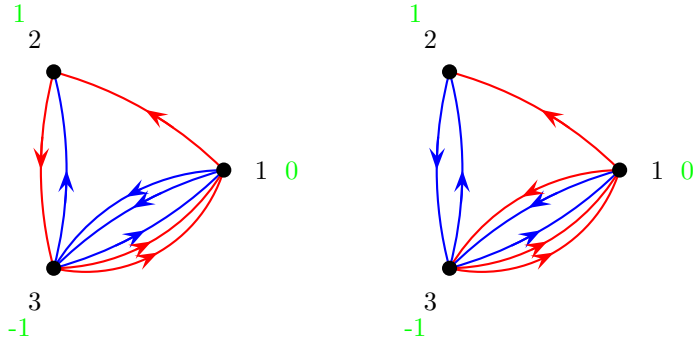


Move Graph

23123 32321 21231 23232

$$-x_{2,3,1,2,3} * x_{3,2,3,2,1} + x_{2,1,2,3,1} * x_{2,3,2,3,2}$$

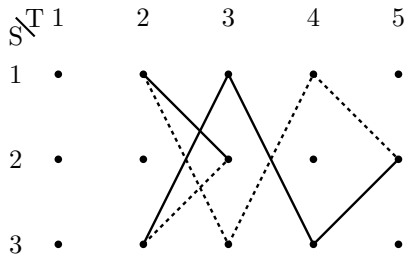
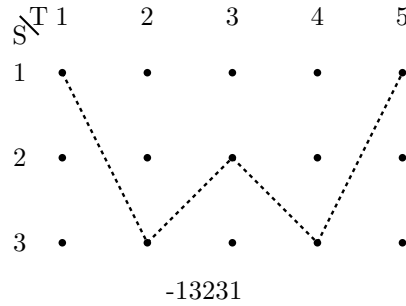
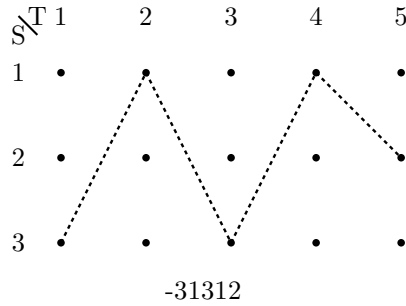
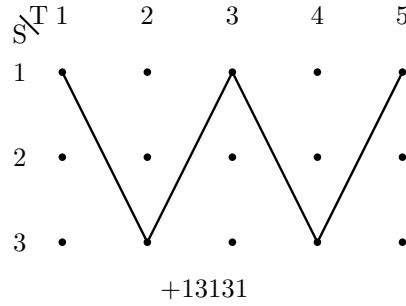
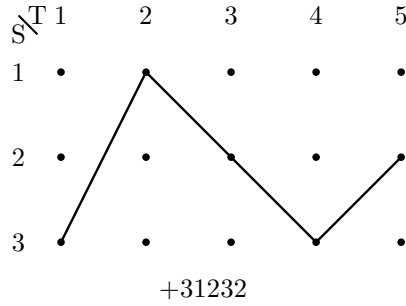
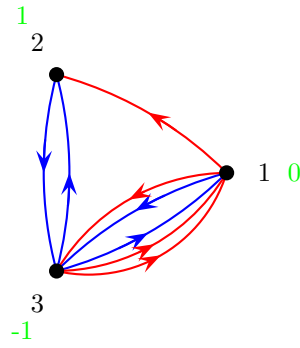
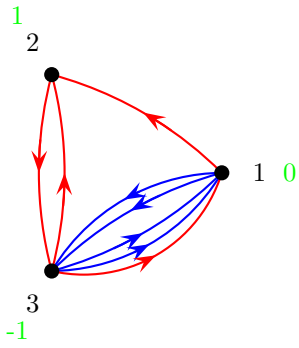
Orbit Size 3



Move Graph

$$31231 \ 13132 \ 31312 \ 13231$$

$$-x_{3,1,2,3,1} * x_{1,3,1,3,2} + x_{3,1,3,1,2} * x_{1,3,2,3,1}$$

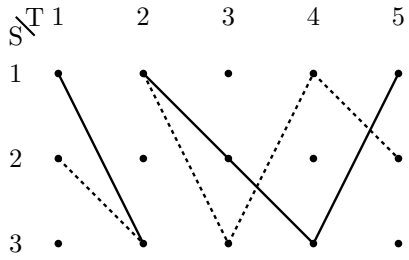
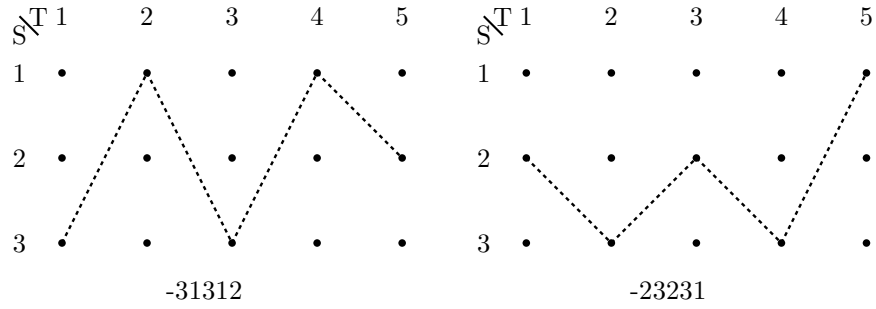
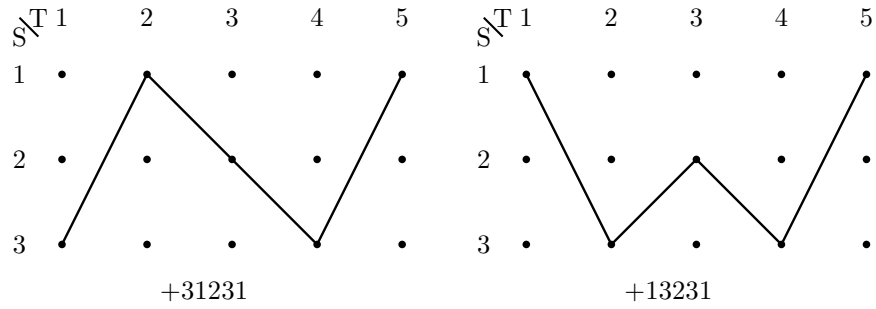
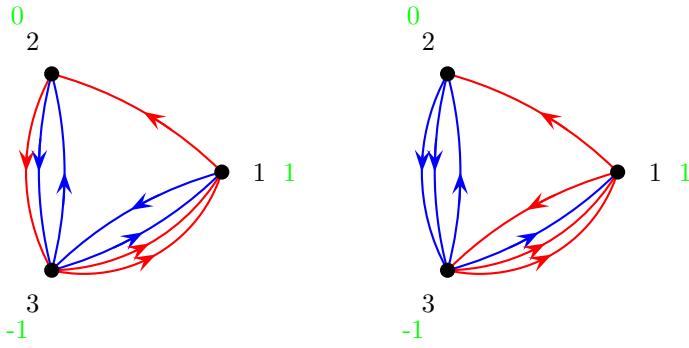


Move Graph

$$31232 \quad 13131 \quad 31312 \quad 13231$$

$$-x_{3,1,2,3,2} * x_{1,3,1,3,1} + x_{3,1,3,1,2} * x_{1,3,2,3,1}$$

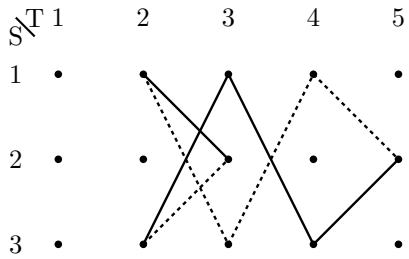
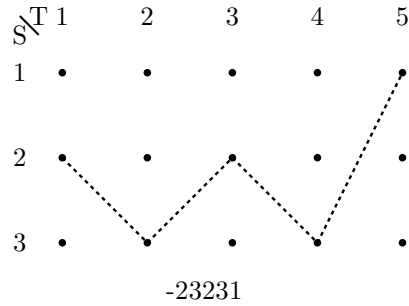
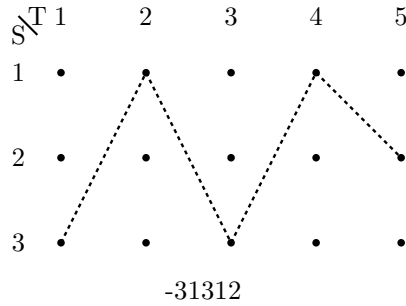
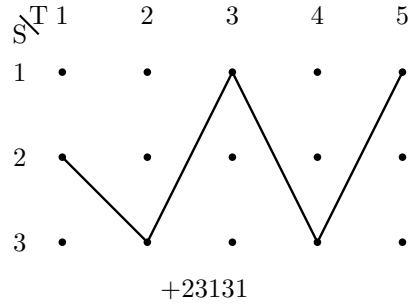
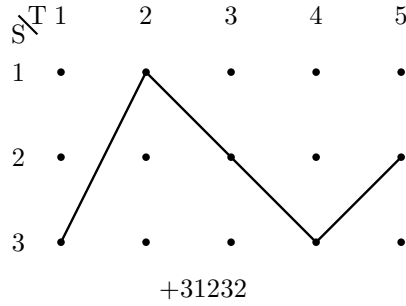
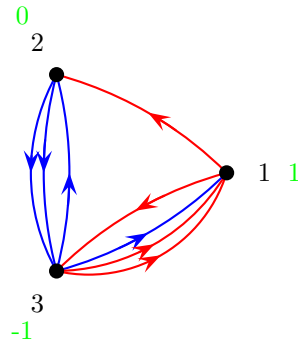
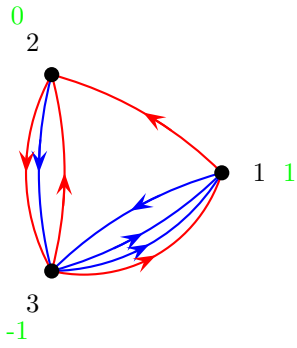
Orbit Size 3



Move Graph

$$31231 \ 13231 \ 31312 \ 23231$$

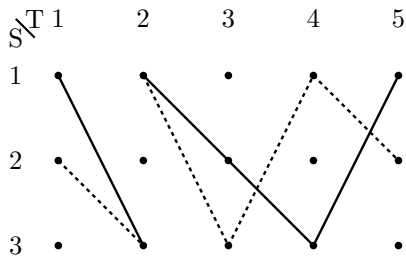
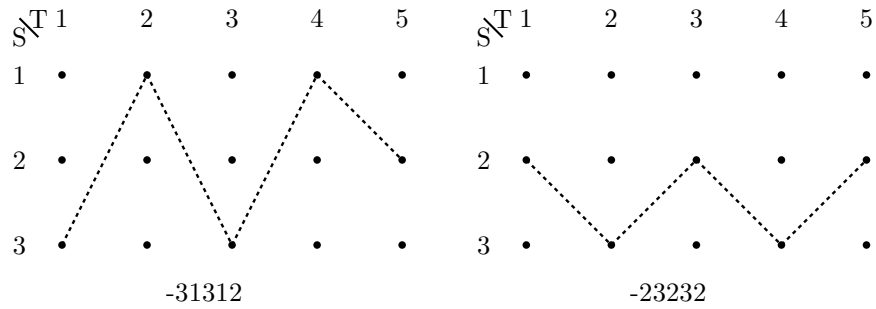
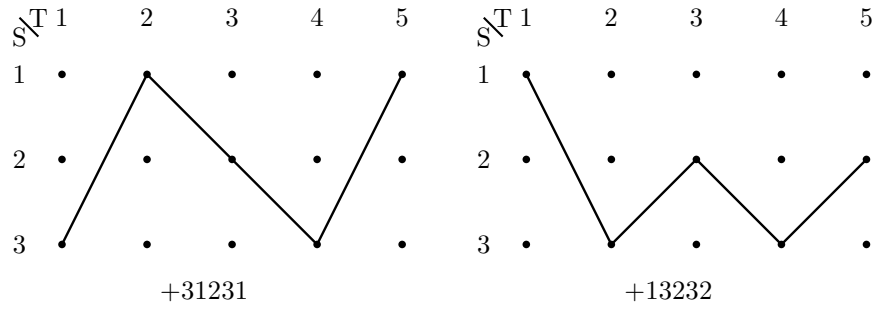
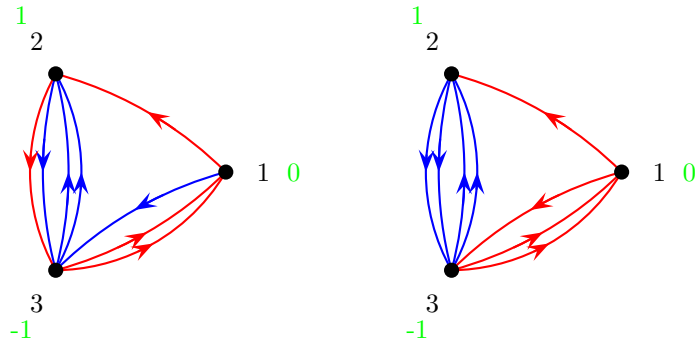
$$-x_{3,1,2,3,1} * x_{1,3,2,3,1} + x_{3,1,3,1,2} * x_{2,3,2,3,1}$$



Move Graph

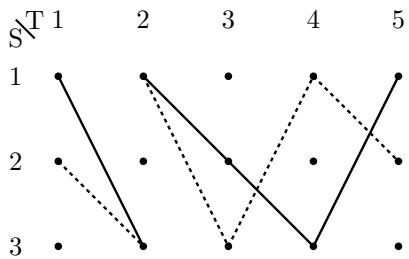
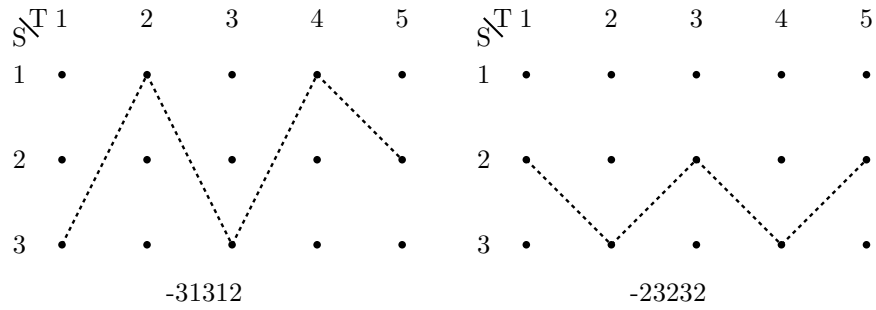
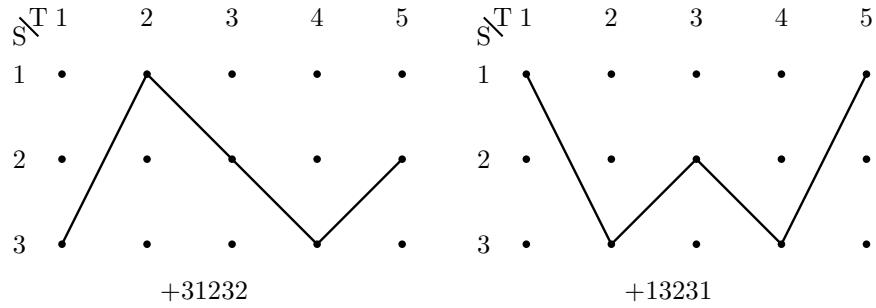
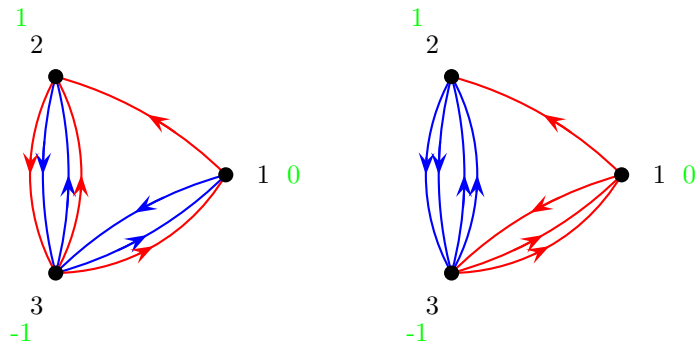
31232 23131 31312 23231
 $-x_{3,1,2,3,2} * x_{2,3,1,3,1} + x_{3,1,3,1,2} * x_{2,3,2,3,1}$

Orbit Size 3



Move Graph

$31231 \ 13232 \ 31312 \ 23232$
 $-x_{3,1,2,3,1} * x_{1,3,2,3,2} + x_{3,1,3,1,2} * x_{2,3,2,3,2}$

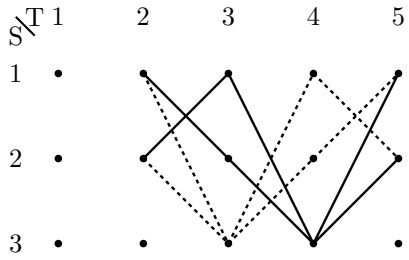
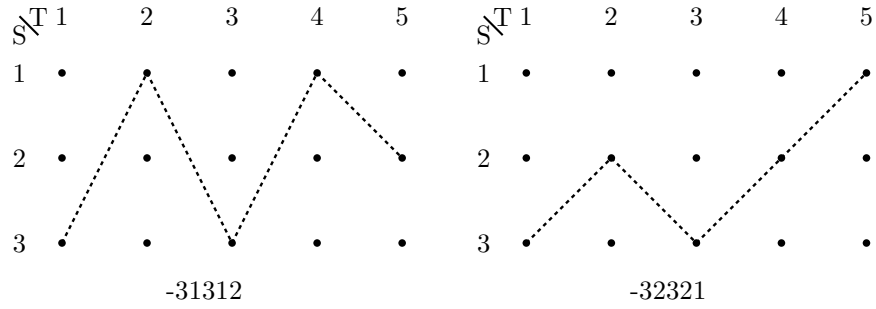
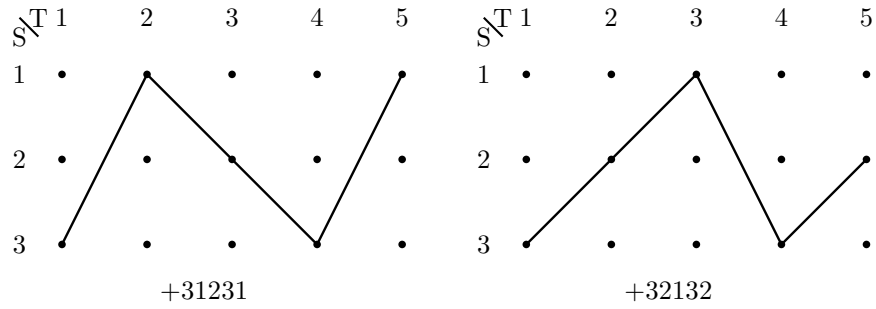
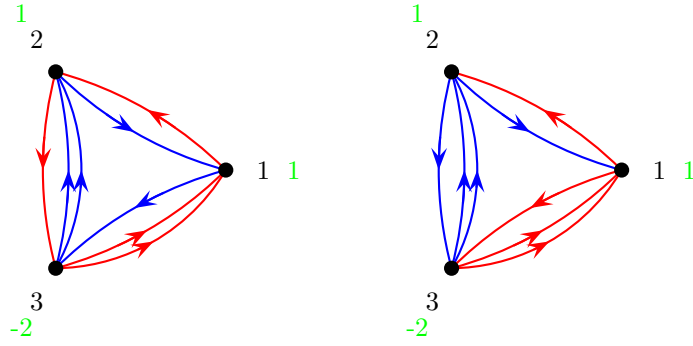


Move Graph

$$31232 \ 13231 \ 31312 \ 23232$$

$$-x_{3,1,2,3,2} * x_{1,3,2,3,1} + x_{3,1,3,1,2} * x_{2,3,2,3,2}$$

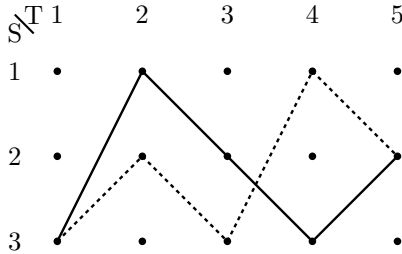
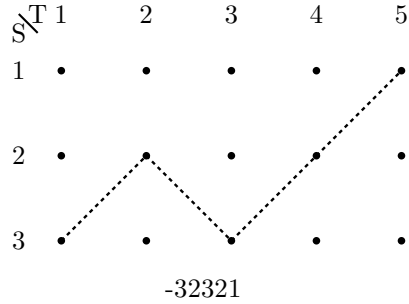
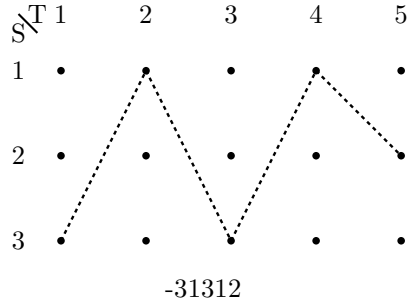
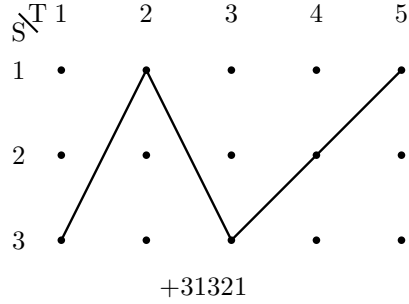
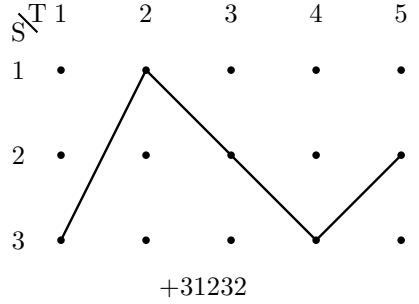
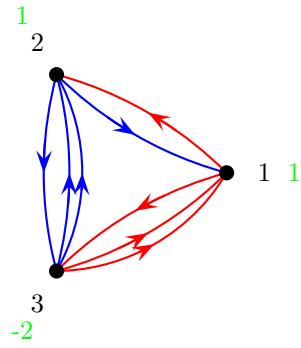
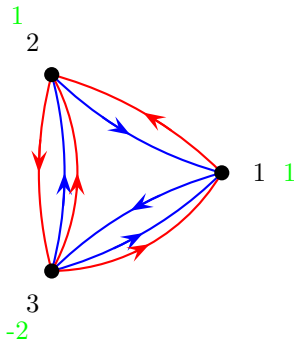
Orbit Size 3



Move Graph

$$31231 \ 32132 \ 31312 \ 32321$$

$$-x_{3,1,2,3,1} * x_{3,2,1,3,2} + x_{3,1,3,1,2} * x_{3,2,3,2,1}$$

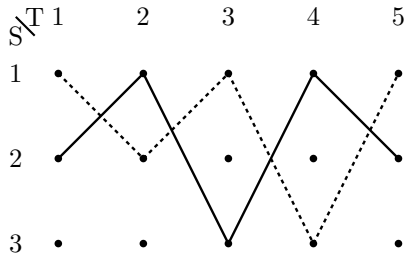
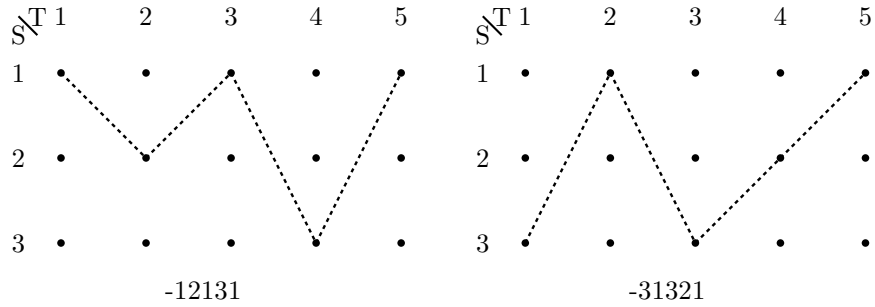
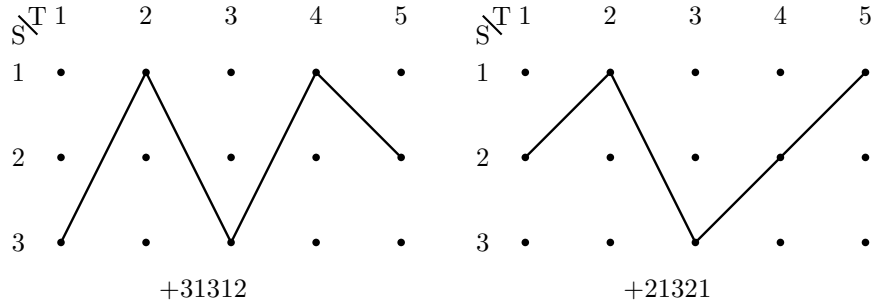
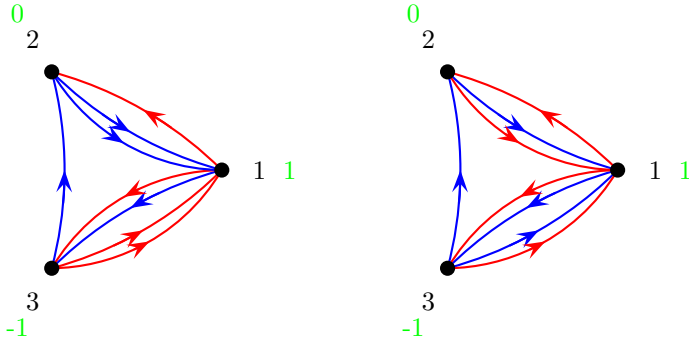


Move Graph

31232 31321 31312 32321

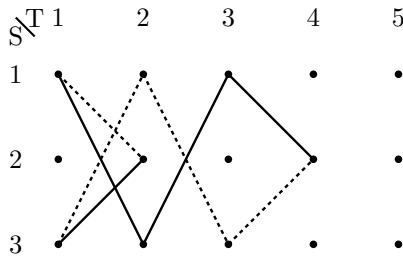
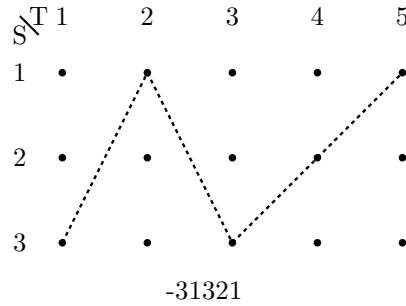
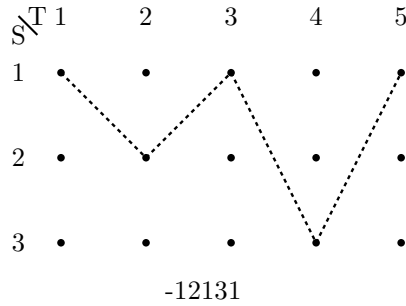
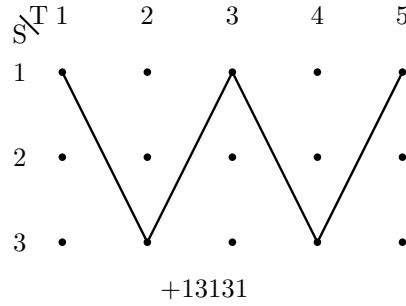
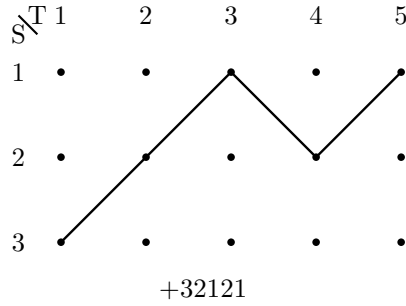
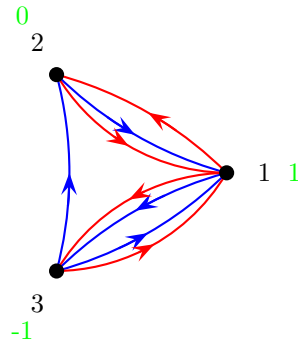
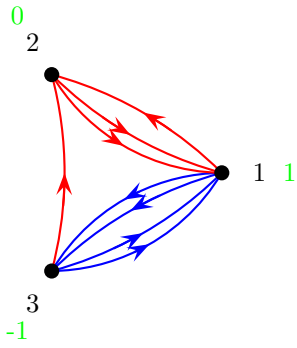
$$-x_{3,1,2,3,2} * x_{3,1,3,2,1} + x_{3,1,3,1,2} * x_{3,2,3,2,1}$$

Orbit Size 3



Move Graph

$31312 \ 21321 \ 12131 \ 31321$
 $-x_{3,1,3,1,2} * x_{2,1,3,2,1} + x_{1,2,1,3,1} * x_{3,1,3,2,1}$

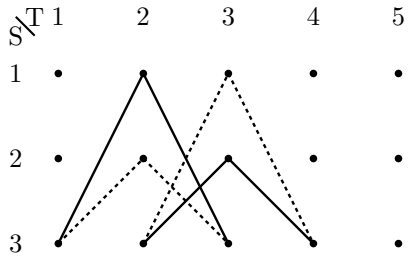
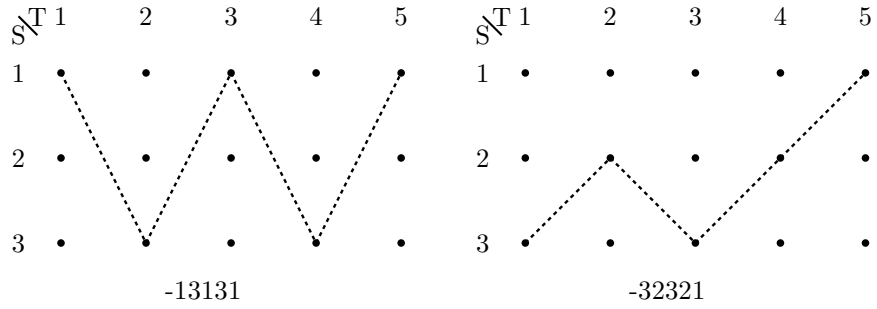
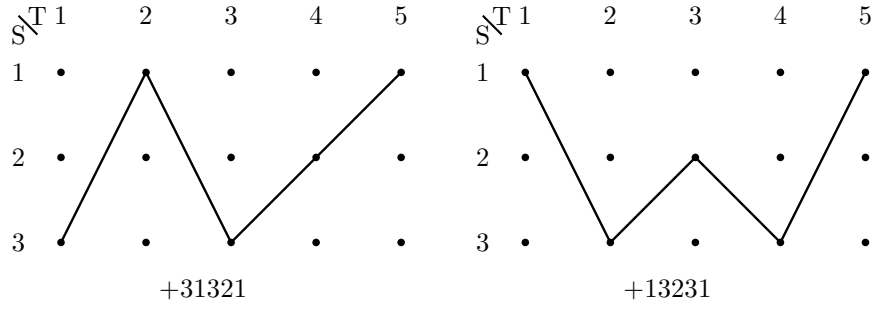
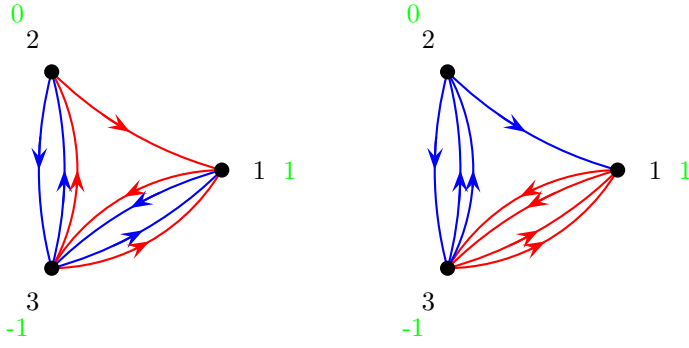


Move Graph

$$32121 \ 13131 \ 12131 \ 31321$$

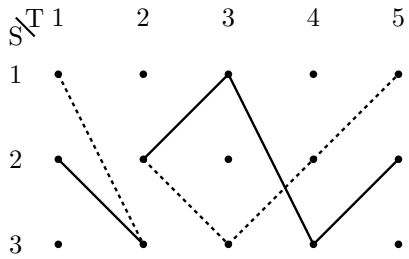
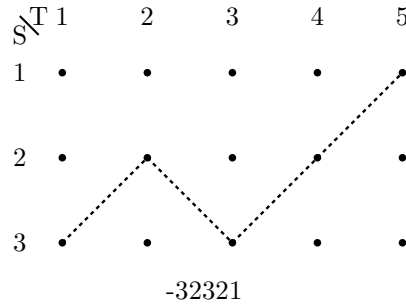
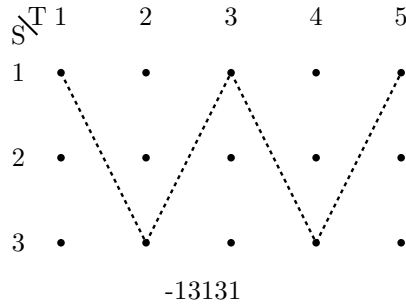
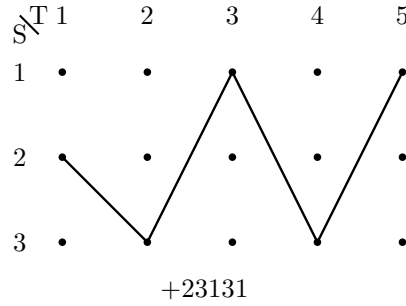
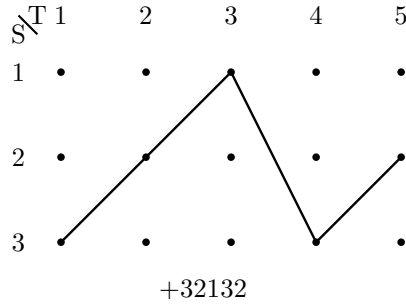
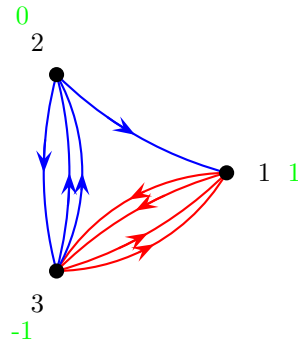
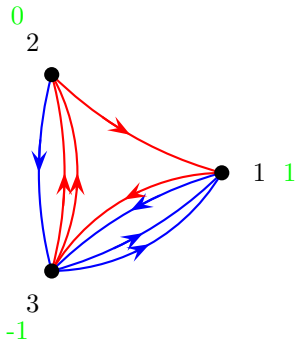
$$-x_{3,2,1,2,1} * x_{1,3,1,3,1} + x_{1,2,1,3,1} * x_{3,1,3,2,1}$$

Orbit Size 3



Move Graph

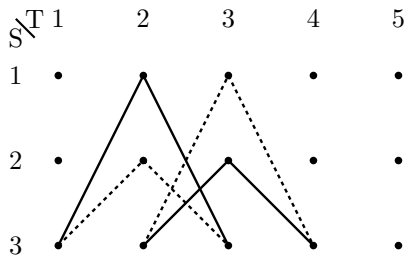
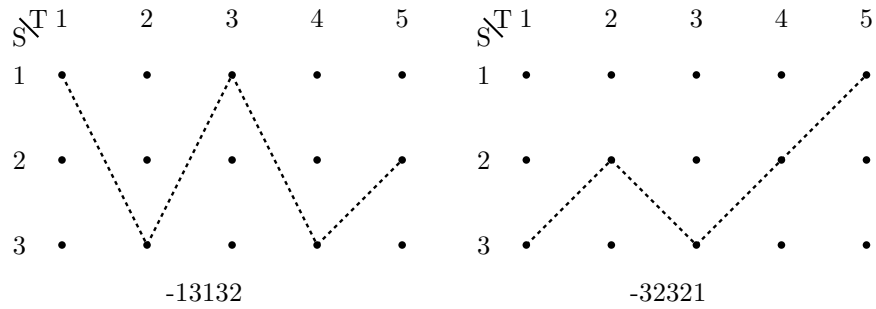
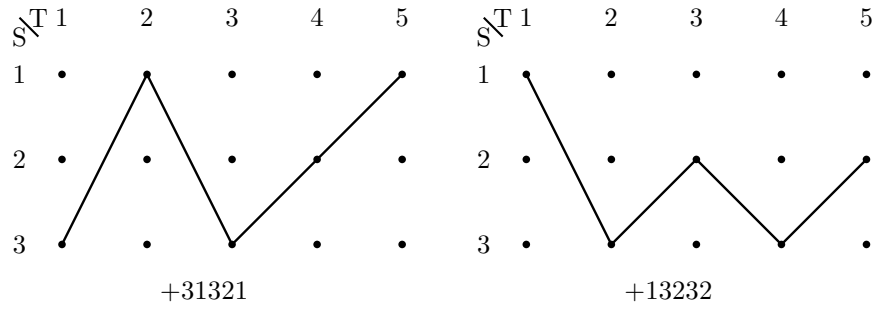
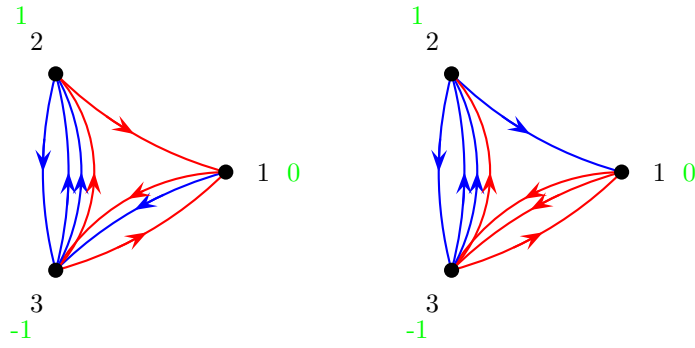
$31321 \ 13231 \ 13131 \ 32321$
 $-x_{3,1,3,2,1} * x_{1,3,2,3,1} + x_{1,3,1,3,1} * x_{3,2,3,2,1}$



Move Graph

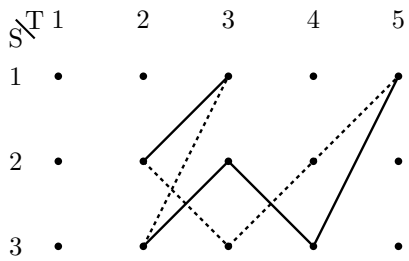
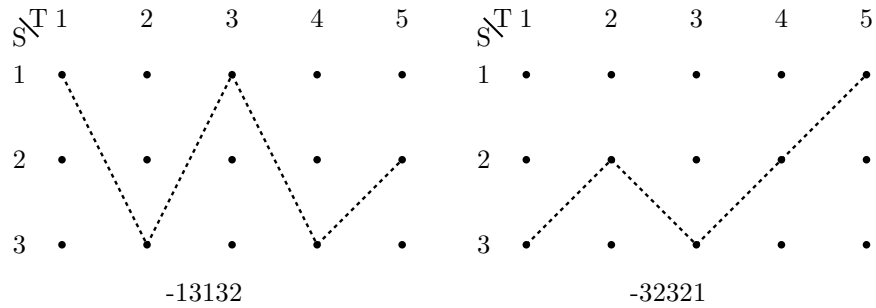
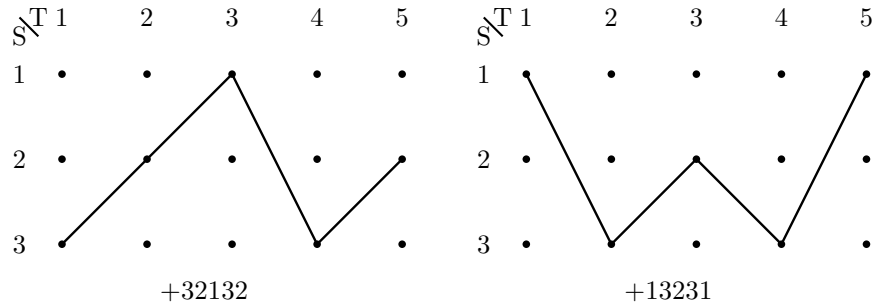
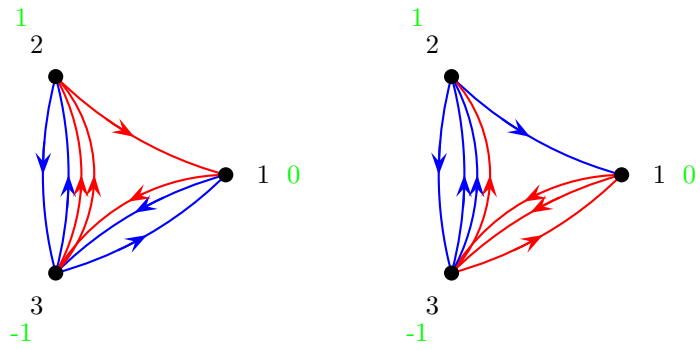
32132 23131 13131 32321
 $-x_{3,2,1,3,2} * x_{2,3,1,3,1} + x_{1,3,1,3,1} * x_{3,2,3,2,1}$

Orbit Size 3



Move Graph

$31321 \ 13232 \ 13132 \ 32321$
 $-x_{3,1,3,2,1} * x_{1,3,2,3,2} + x_{1,3,1,3,2} * x_{3,2,3,2,1}$

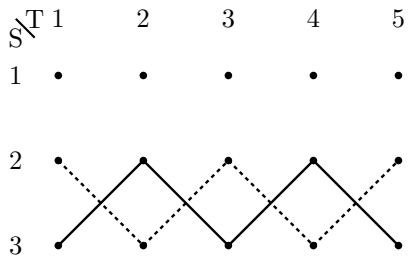
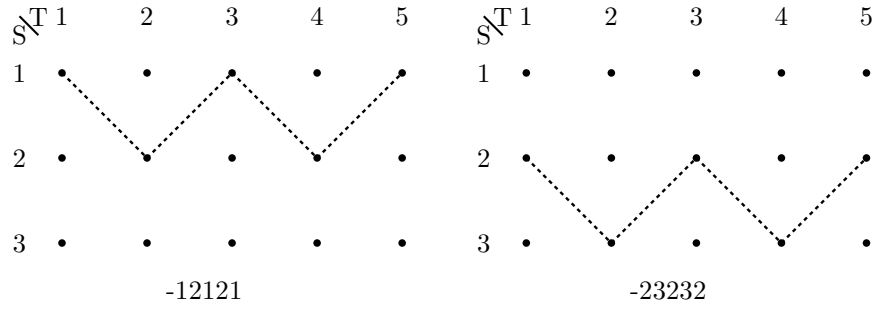
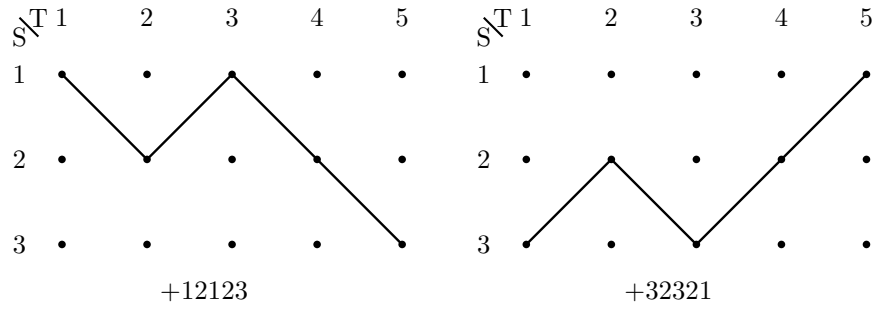
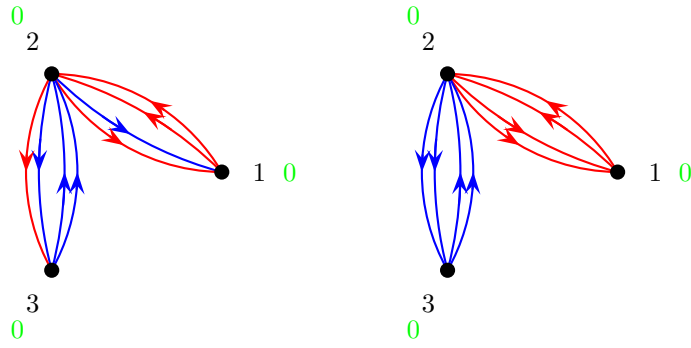


Move Graph

$$32132 \ 13231 \ 13132 \ 32321$$

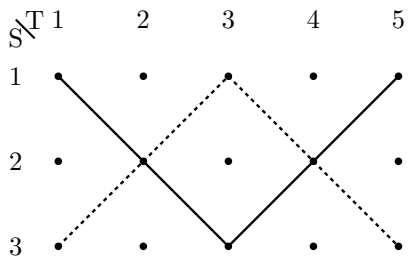
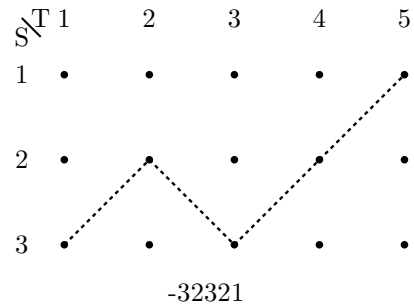
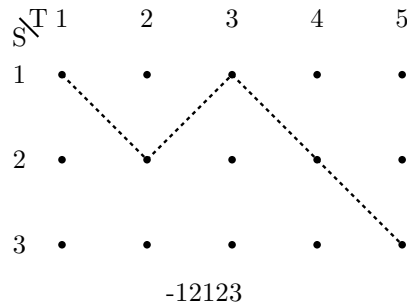
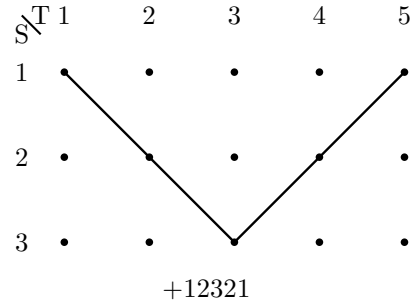
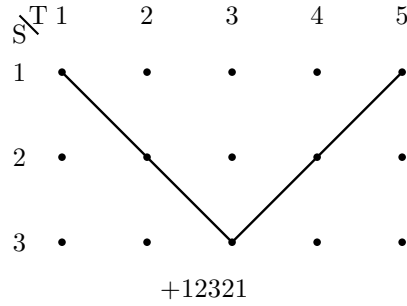
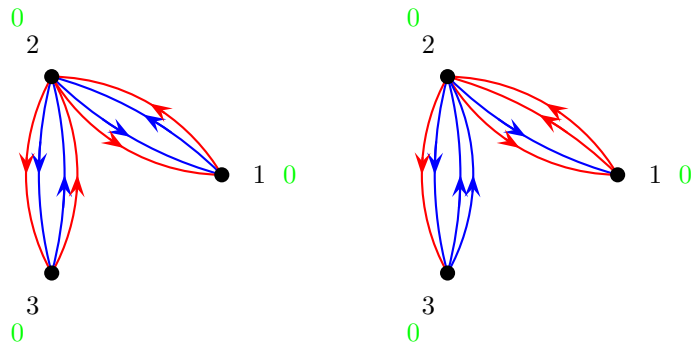
$$-x_{3,2,1,3,2} * x_{1,3,2,3,1} + x_{1,3,1,3,2} * x_{3,2,3,2,1}$$

Orbit Size 4



Move Graph

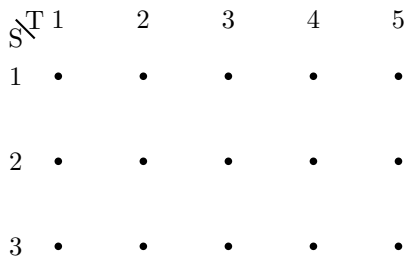
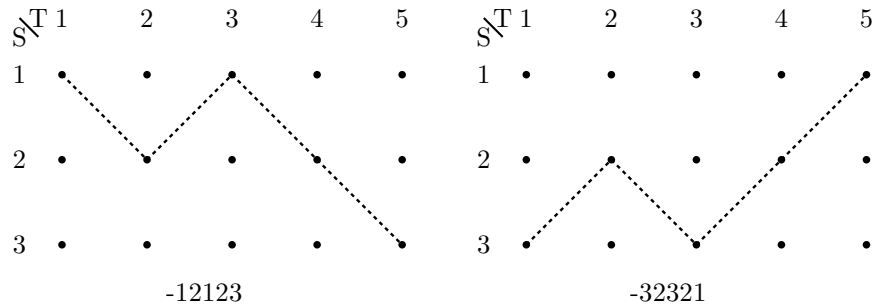
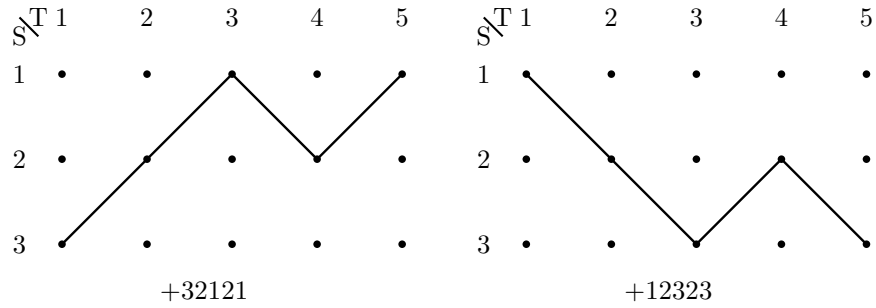
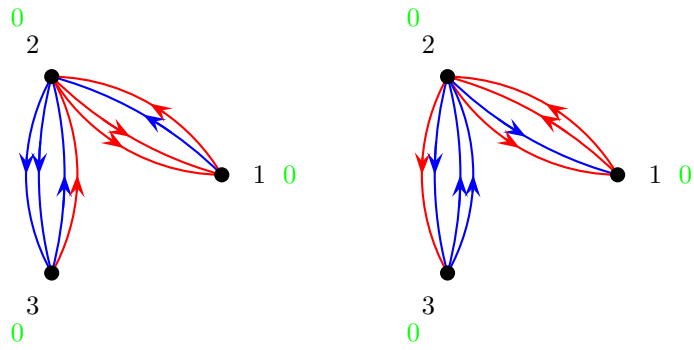
$12123 \ 32321 \ 12121 \ 23232$
 $-x_{1,2,1,2,3} * x_{3,2,3,2,1} + x_{1,2,1,2,1} * x_{2,3,2,3,2}$



Move Graph

$$12321 \ 12321 \ 12123 \ 32321$$

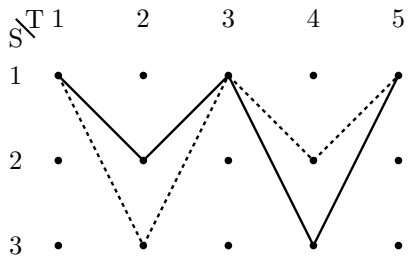
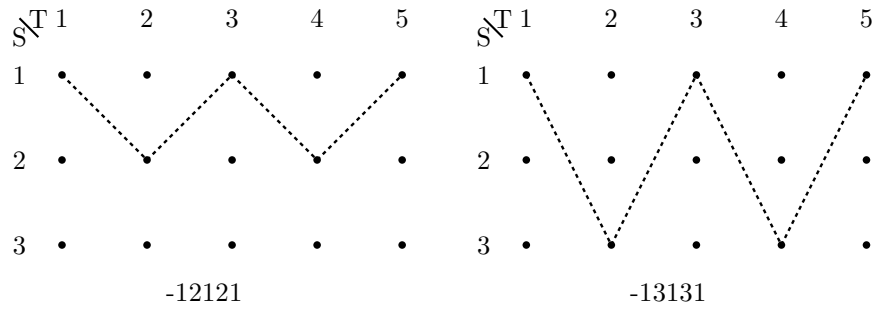
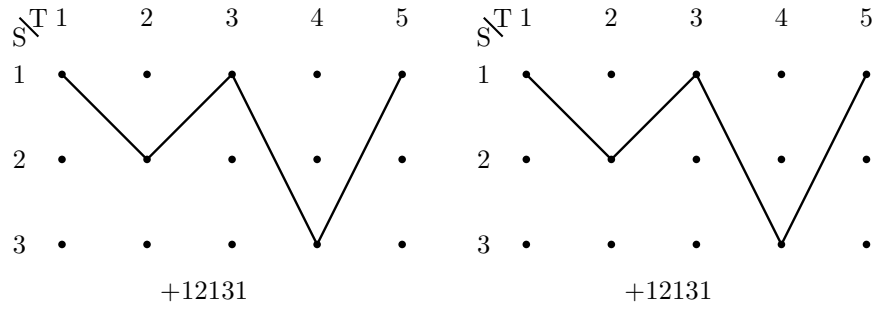
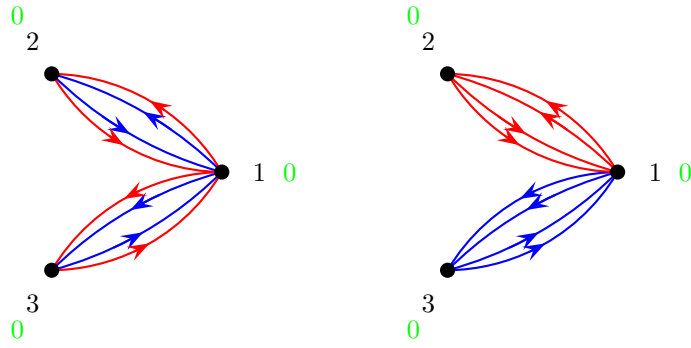
$$-x_{1,2,3,2,1}^2 + x_{1,2,1,2,3} * x_{3,2,3,2,1}$$



Move Graph

$32121 \ 12323 \ 12123 \ 32321$
 $-x_{3,2,1,2,1} * x_{1,2,3,2,3} + x_{1,2,1,2,3} * x_{3,2,3,2,1}$

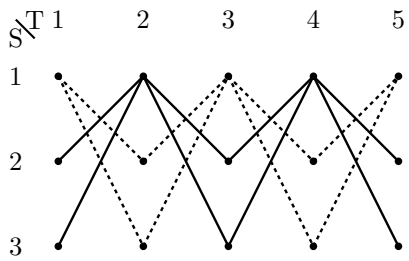
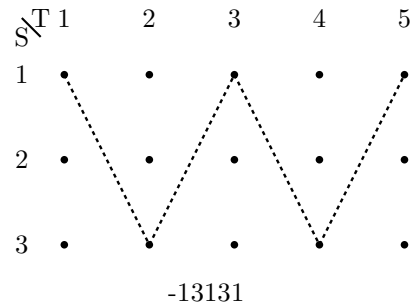
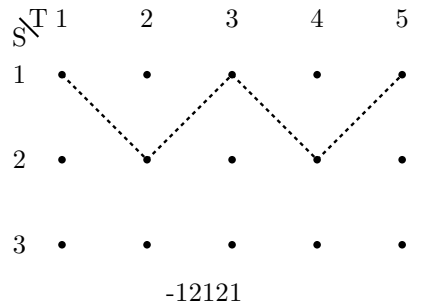
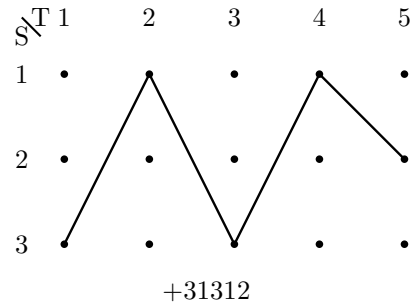
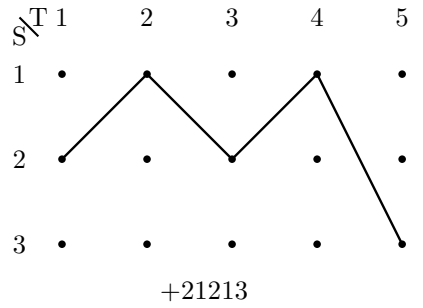
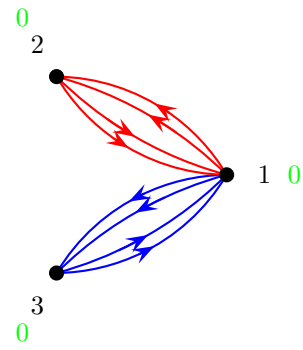
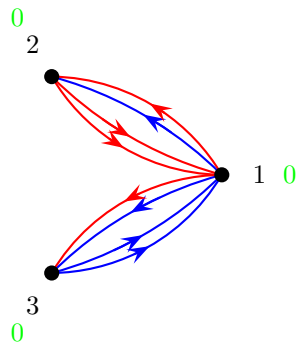
Orbit Size 4



Move Graph

$$12131 \ 12131 \ 12121 \ 13131$$

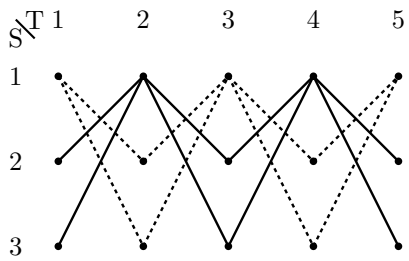
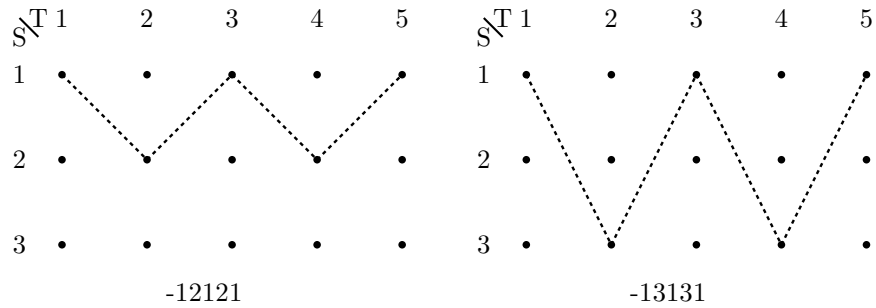
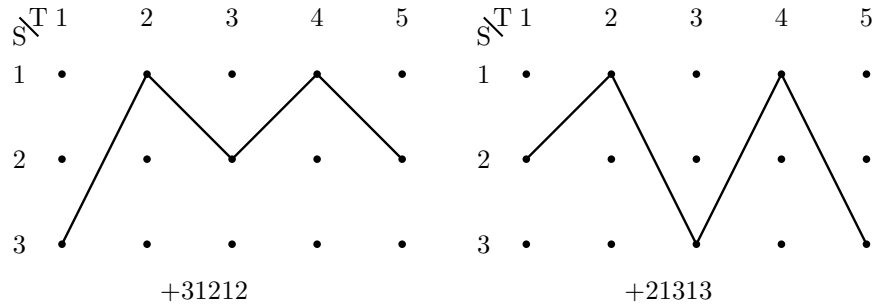
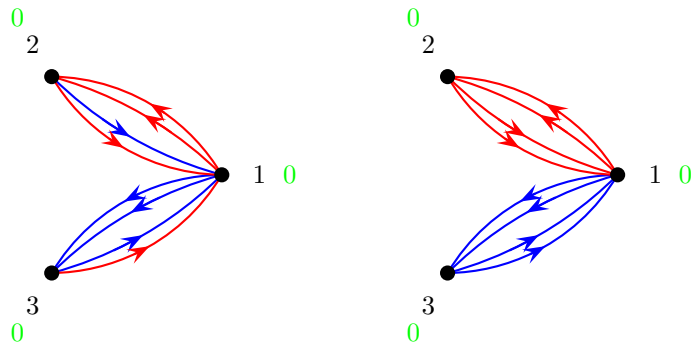
$$-x_{1,2,1,3,1}^2 + x_{1,2,1,2,1} * x_{1,3,1,3,1}$$



Move Graph

21213 31312 12121 13131

$$-x_{2,1,2,1,3} * x_{3,1,3,1,2} + x_{1,2,1,2,1} * x_{1,3,1,3,1}$$

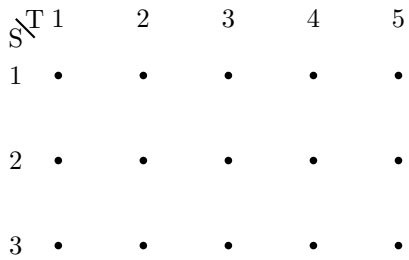
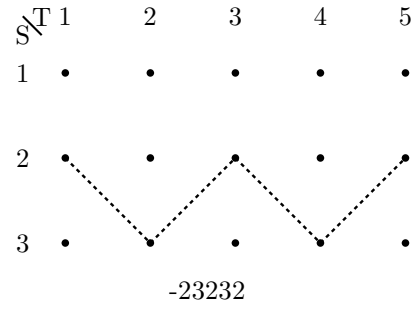
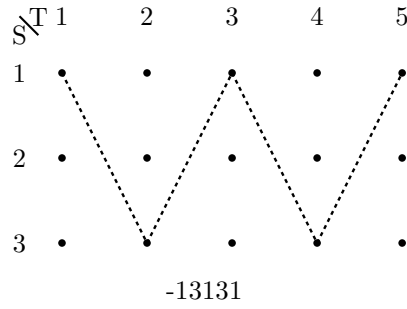
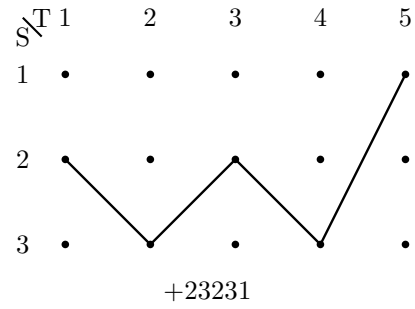
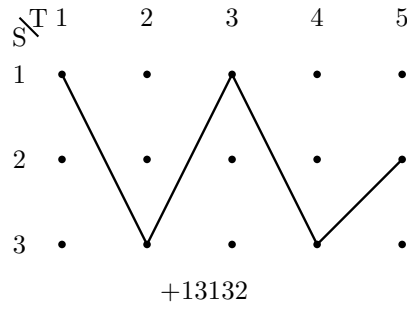
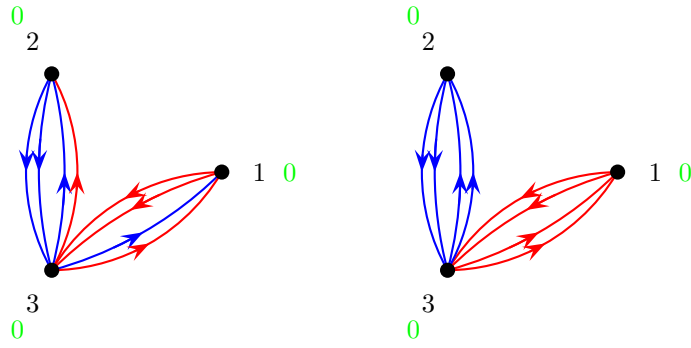


Move Graph

$$31212 \ 21313 \ 12121 \ 13131$$

$$-x_{3,1,2,1,2} * x_{2,1,3,1,3} + x_{1,2,1,2,1} * x_{1,3,1,3,1}$$

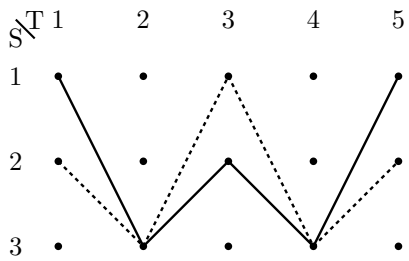
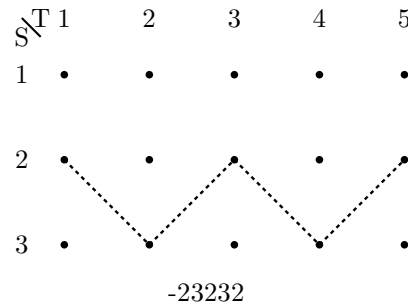
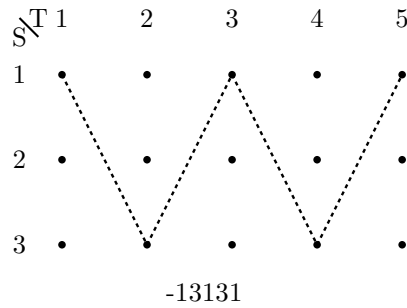
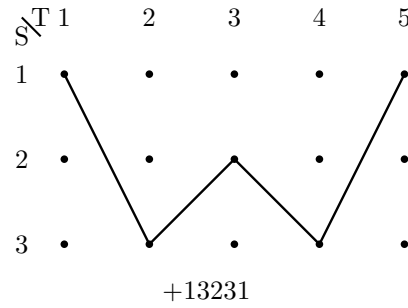
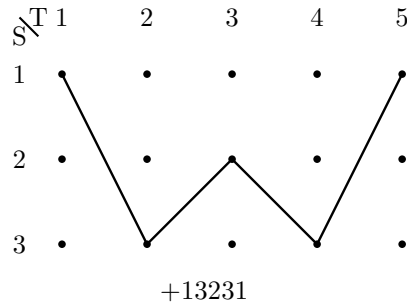
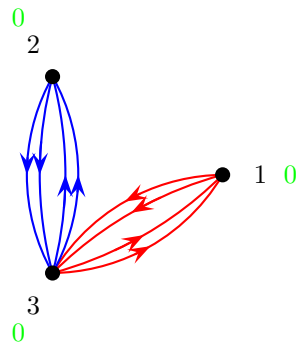
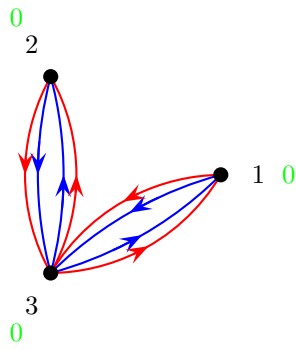
Orbit Size 4



Move Graph

$$13132 \ 23231 \ 13131 \ 23232$$

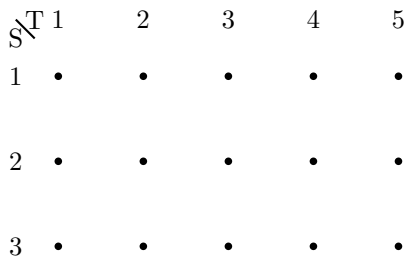
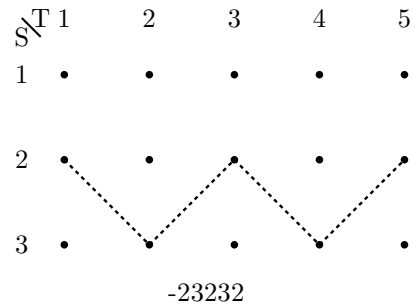
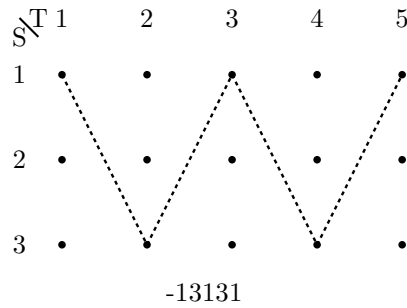
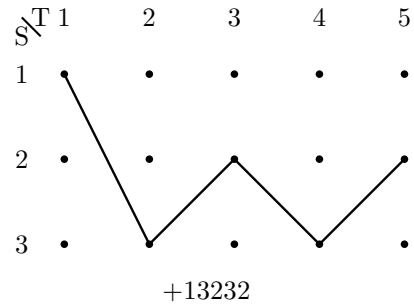
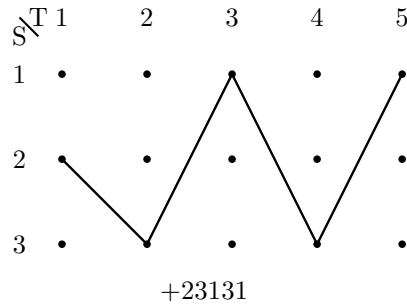
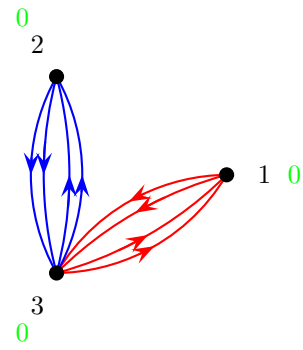
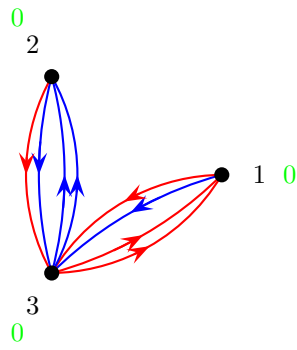
$$-x_{1,3,1,3,2} * x_{2,3,2,3,1} + x_{1,3,1,3,1} * x_{2,3,2,3,2}$$



Move Graph

$$13231 \ 13231 \ 13131 \ 23232$$

$$-x_{1,3,2,3,1}^2 + x_{1,3,1,3,1} * x_{2,3,2,3,2}$$

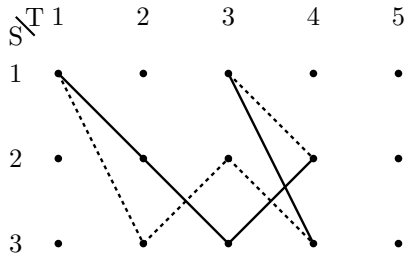
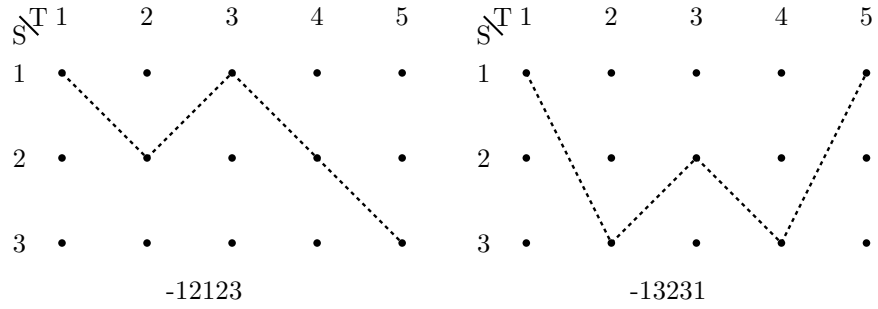
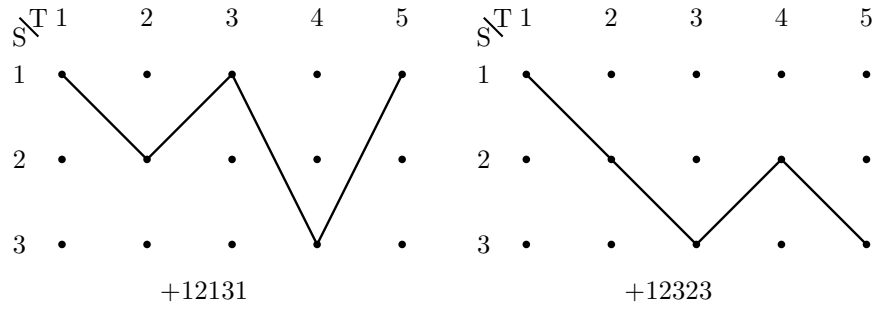
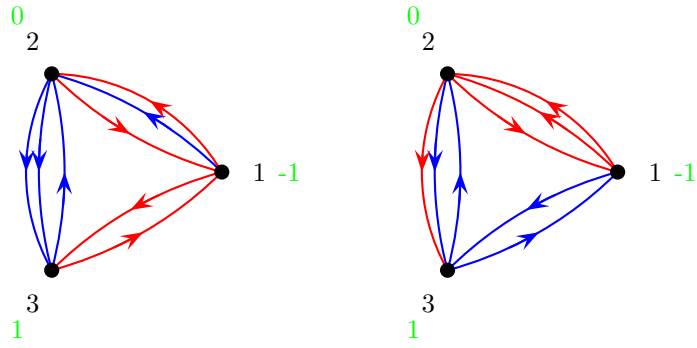


Move Graph

$$23131 \ 13232 \ 13131 \ 23232$$

$$-x_{2,3,1,3,1} * x_{1,3,2,3,2} + x_{1,3,1,3,1} * x_{2,3,2,3,2}$$

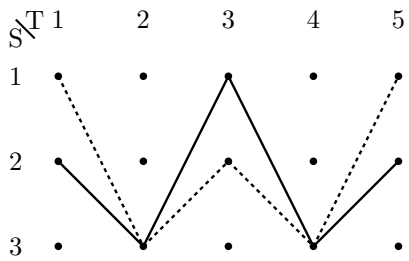
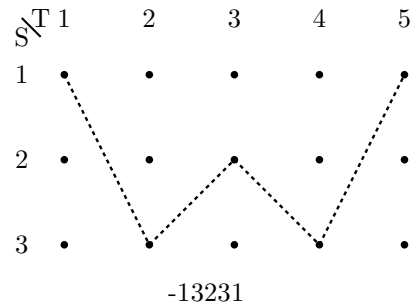
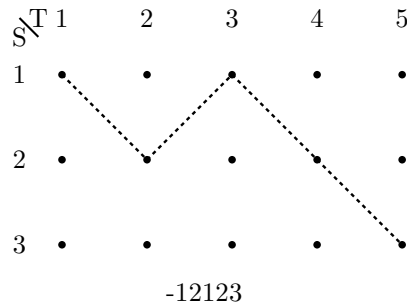
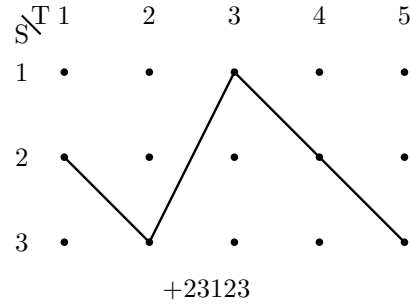
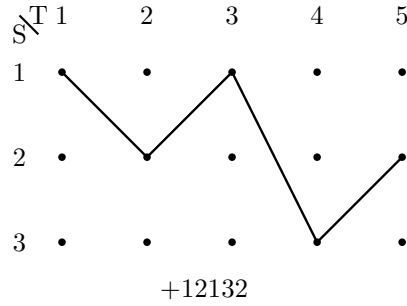
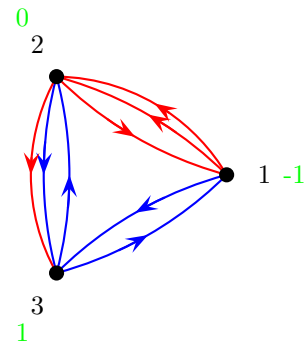
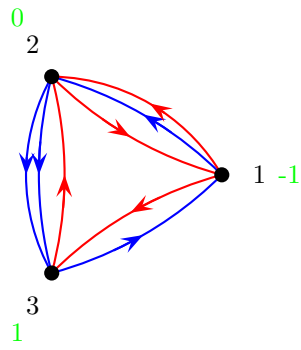
Orbit Size 5



Move Graph

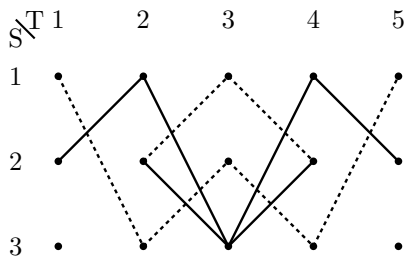
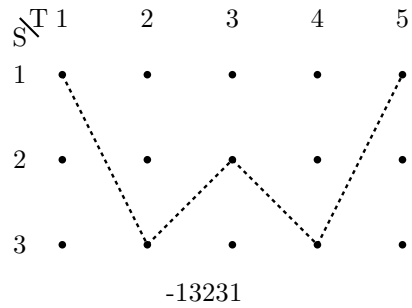
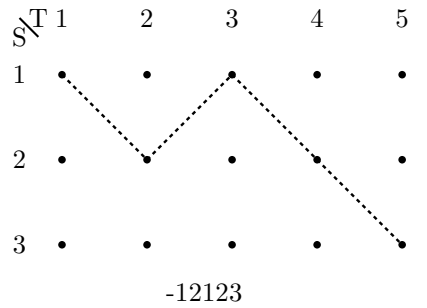
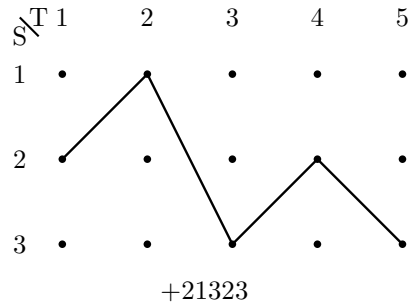
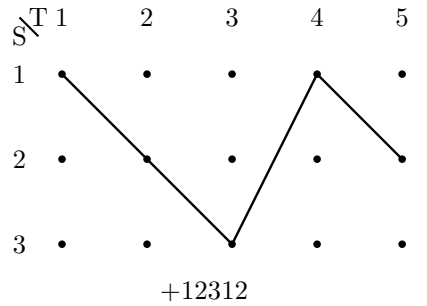
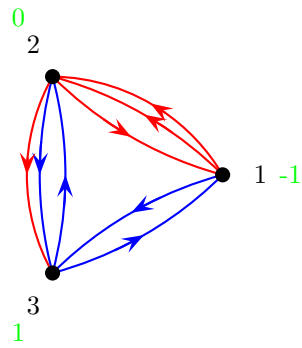
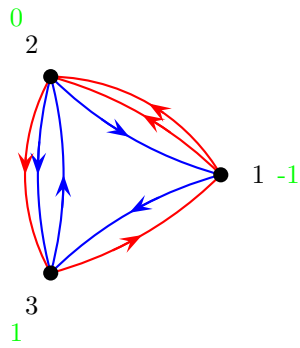
$$12131 \ 12323 \ 12123 \ 13231$$

$$-x_{1,2,1,3,1} * x_{1,2,3,2,3} + x_{1,2,1,2,3} * x_{1,3,2,3,1}$$



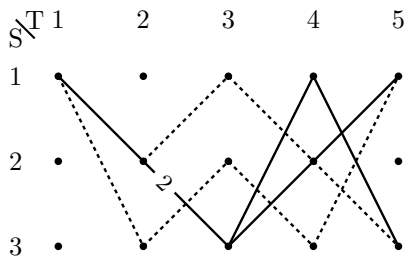
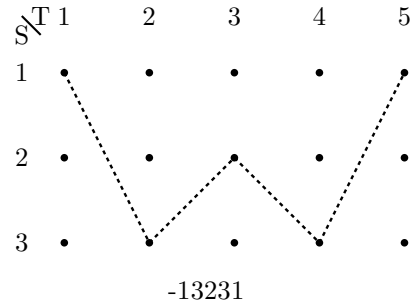
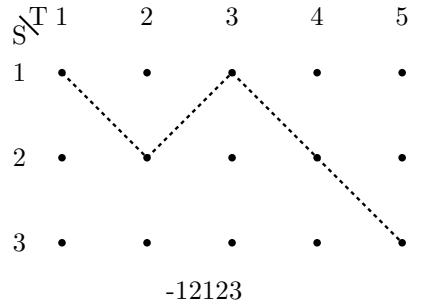
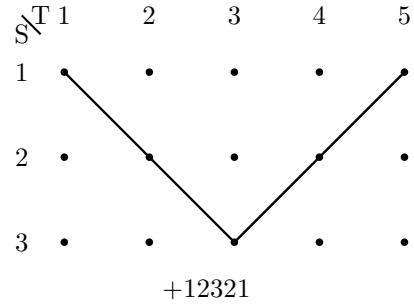
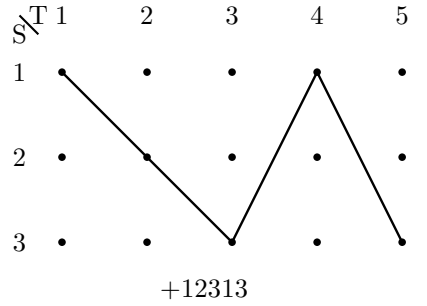
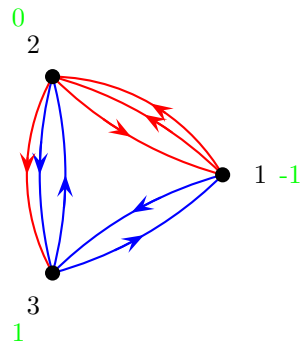
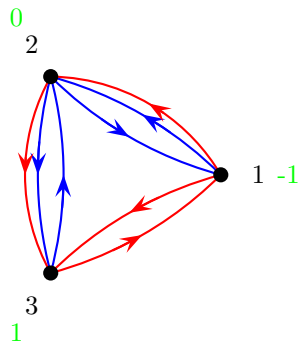
Move Graph

12132 23123 12123 13231
 $-x_{1,2,1,3,2} * x_{2,3,1,2,3} + x_{1,2,1,2,3} * x_{1,3,2,3,1}$



Move Graph

12312 21323 12123 13231
 $-x_{1,2,3,1,2} * x_{2,1,3,2,3} + x_{1,2,1,2,3} * x_{1,3,2,3,1}$

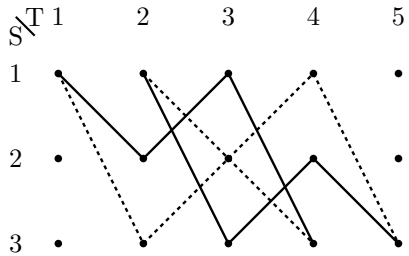
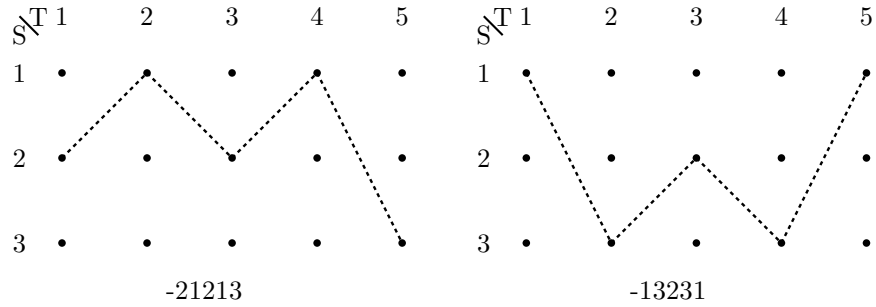
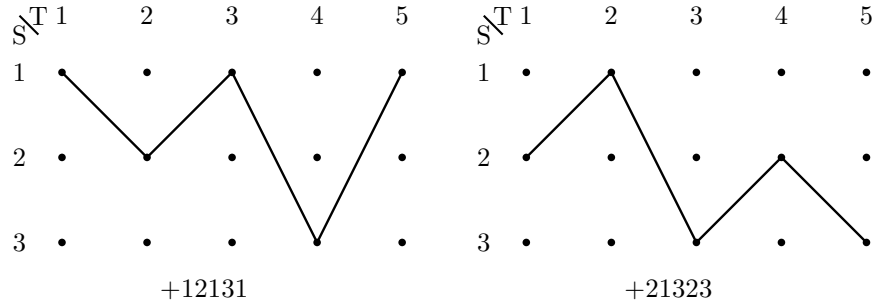
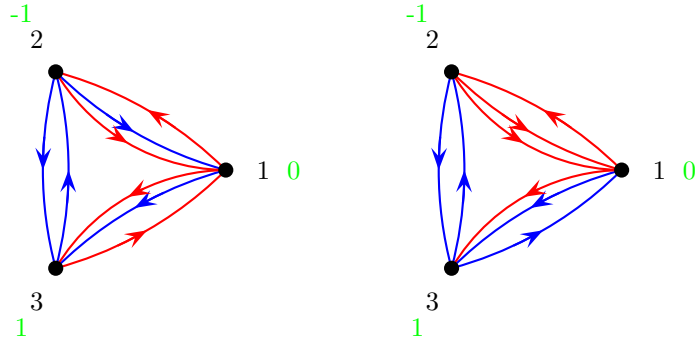


Move Graph

$$12313 \ 12321 \ 12123 \ 13231$$

$$-x_{1,2,3,1,3} * x_{1,2,3,2,1} + x_{1,2,1,2,3} * x_{1,3,2,3,1}$$

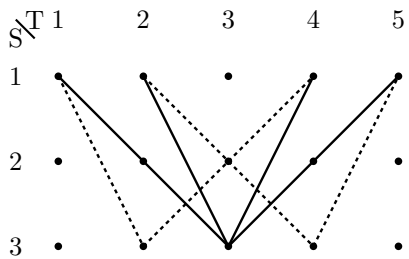
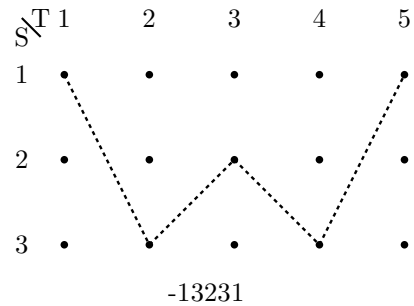
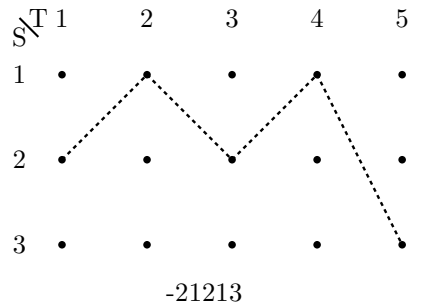
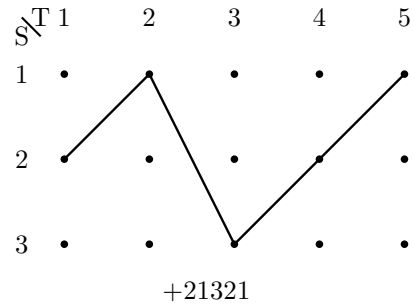
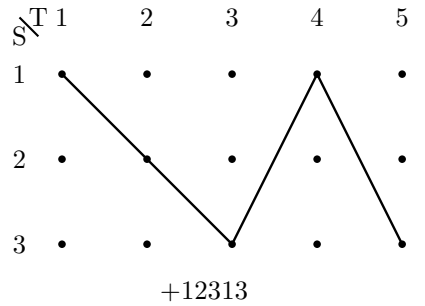
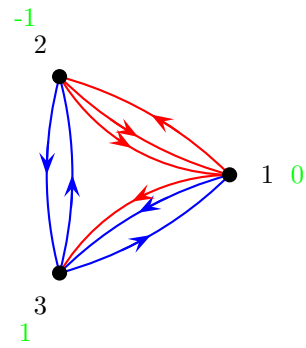
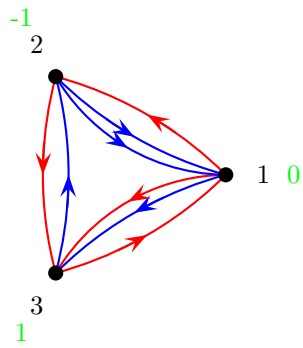
Orbit Size 5



Move Graph

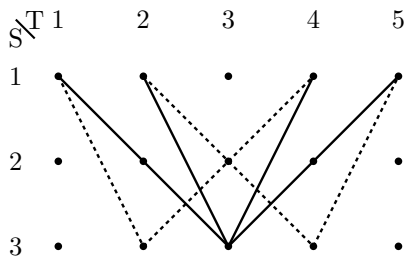
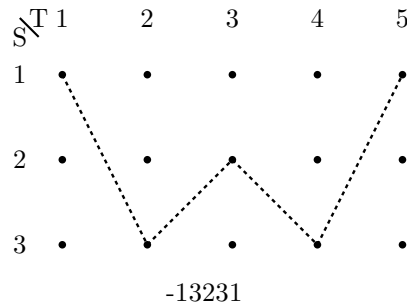
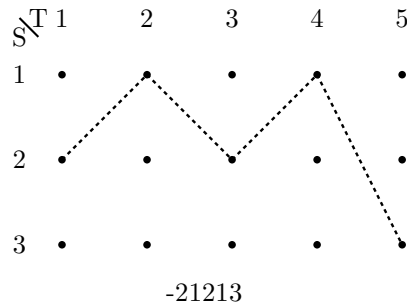
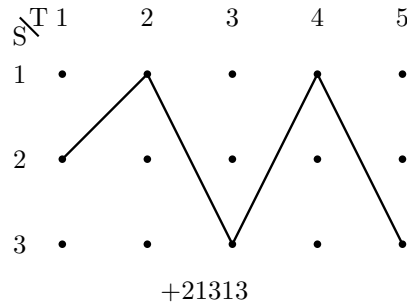
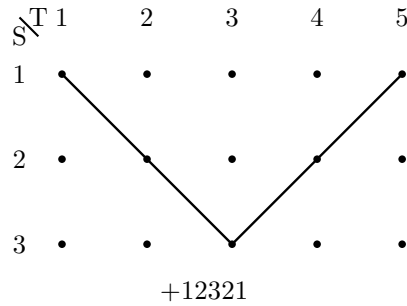
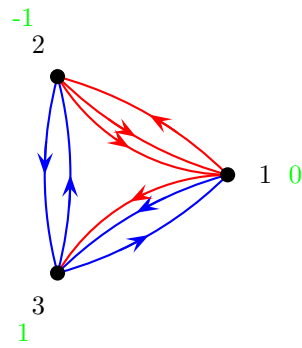
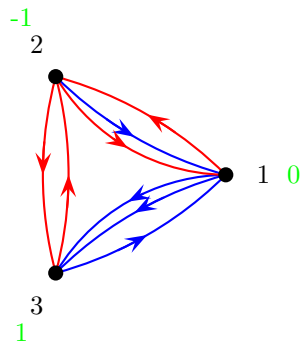
$$12131 \ 21323 \ 21213 \ 13231$$

$$-x_{1,2,1,3,1} * x_{2,1,3,2,3} + x_{2,1,2,1,3} * x_{1,3,2,3,1}$$



Move Graph

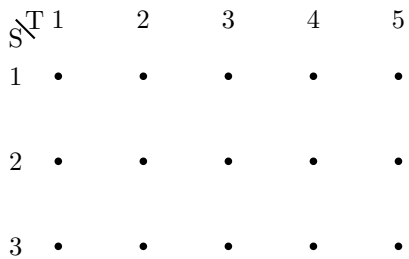
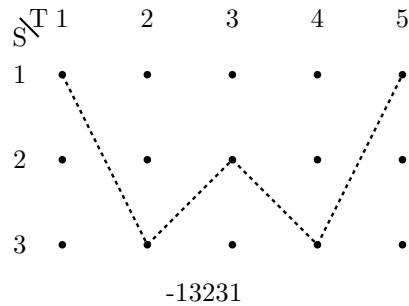
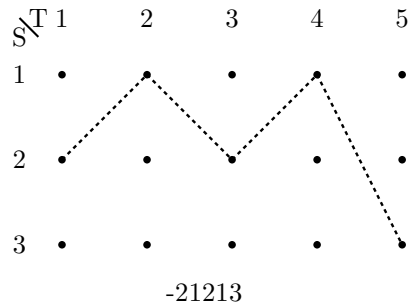
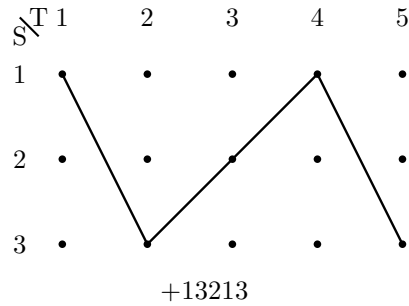
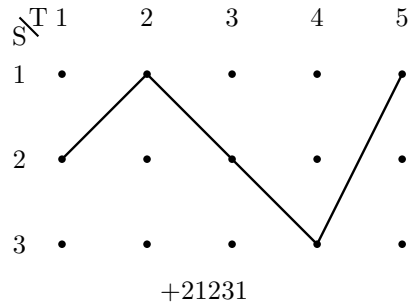
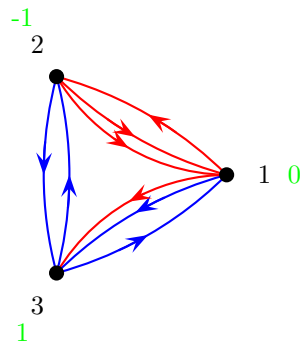
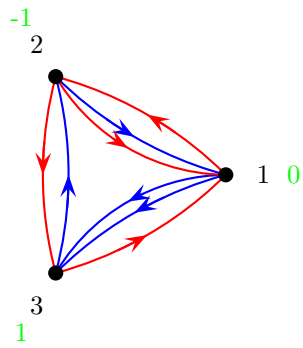
12313 21321 21213 13231
 $-x_{1,2,3,1,3} * x_{2,1,3,2,1} + x_{2,1,2,1,3} * x_{1,3,2,3,1}$



Move Graph

$$12321 \ 21313 \ 21213 \ 13231$$

$$-x_{1,2,3,2,1} * x_{2,1,3,1,3} + x_{2,1,2,1,3} * x_{1,3,2,3,1}$$

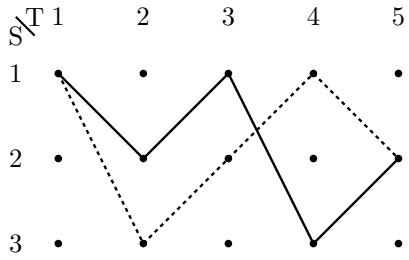
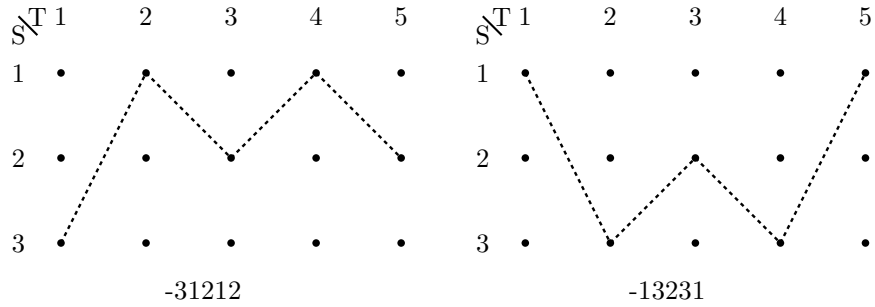
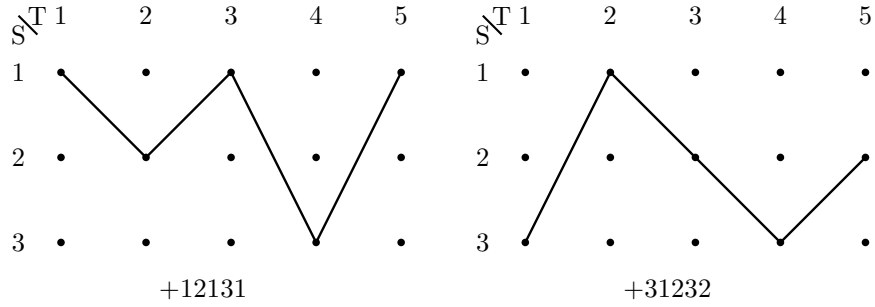
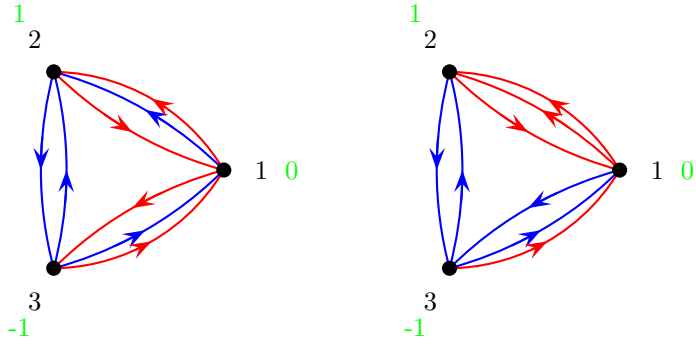


Move Graph

21231 13213 21213 13231

$$-x_{2,1,2,3,1} * x_{1,3,2,1,3} + x_{2,1,2,1,3} * x_{1,3,2,3,1}$$

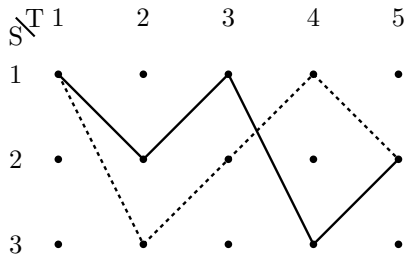
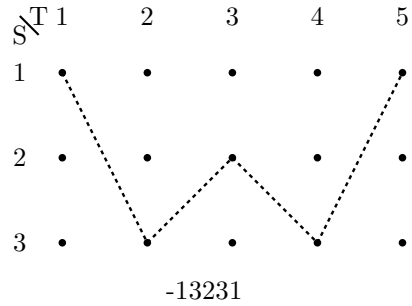
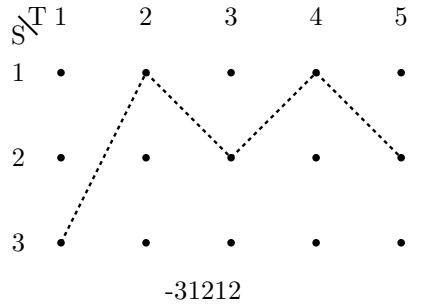
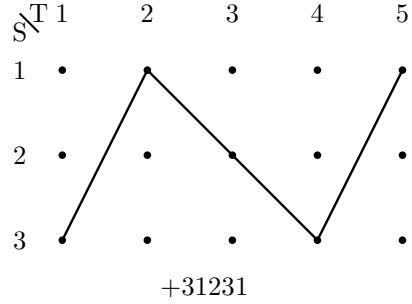
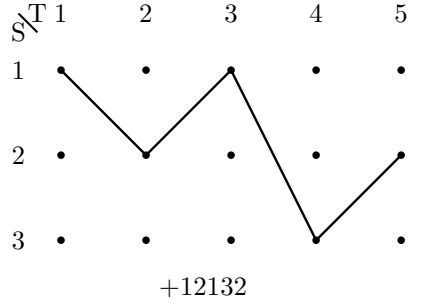
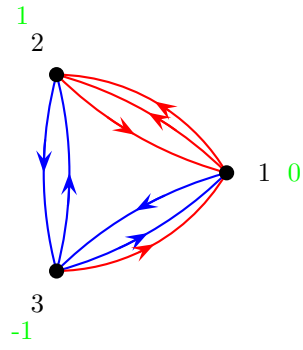
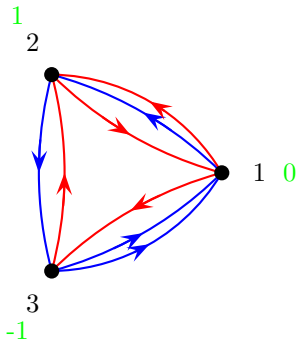
Orbit Size 5



Move Graph

$$12131 \ 31232 \ 31212 \ 13231$$

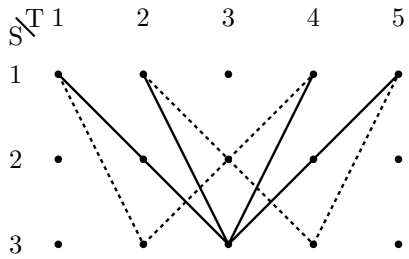
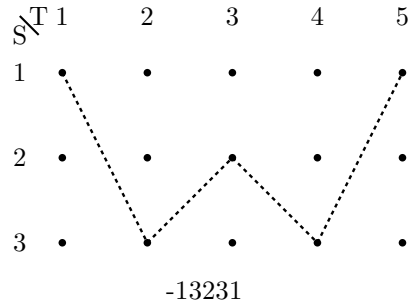
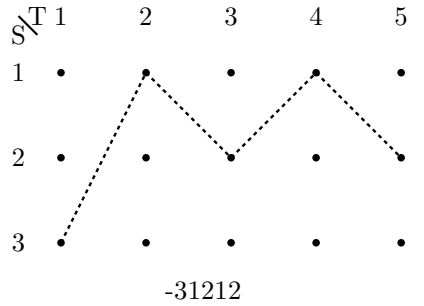
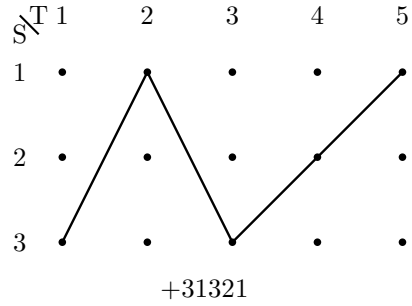
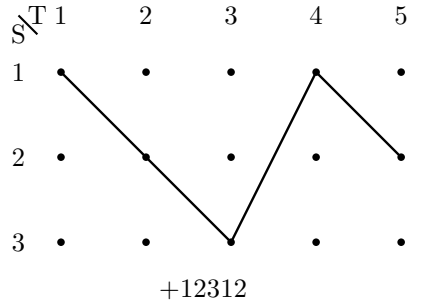
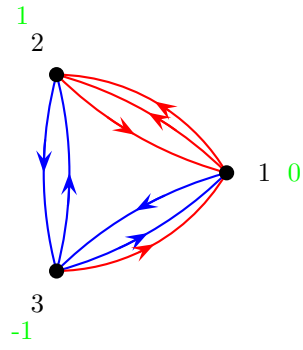
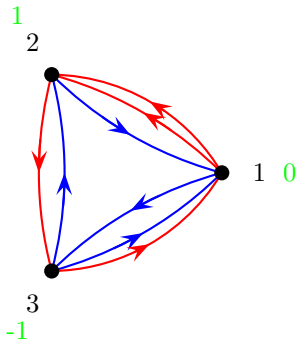
$$-x_{1,2,1,3,1} * x_{3,1,2,3,2} + x_{3,1,2,1,2} * x_{1,3,2,3,1}$$



Move Graph

12132 31231 31212 13231

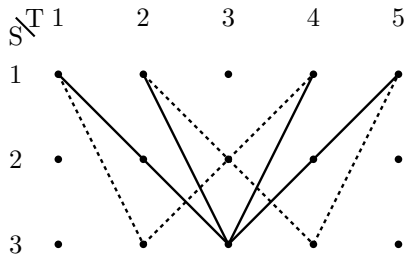
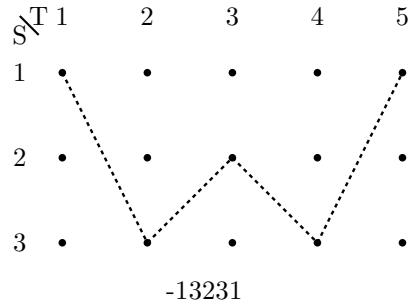
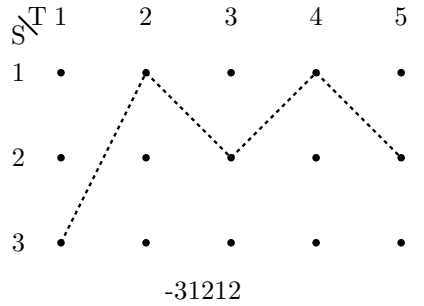
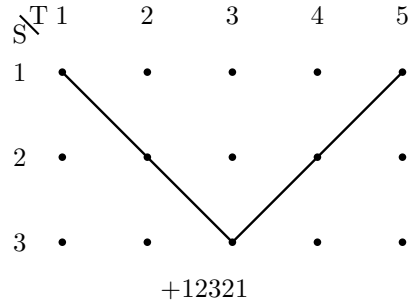
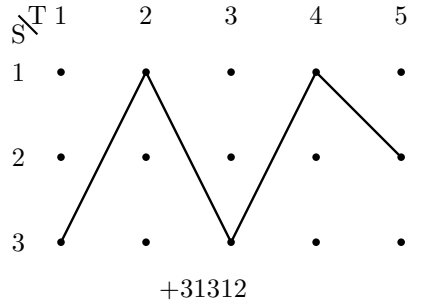
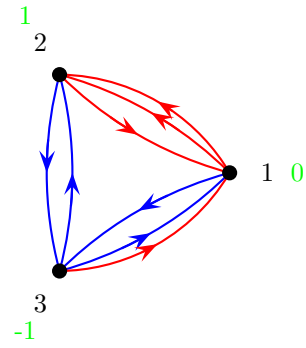
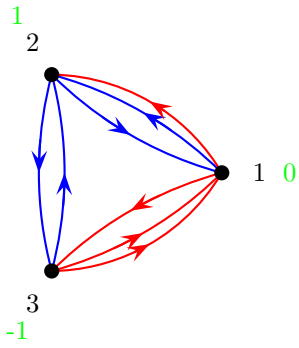
$$-x_{1,2,1,3,2} * x_{3,1,2,3,1} + x_{3,1,2,1,2} * x_{1,3,2,3,1}$$



Move Graph

12312 31321 31212 13231

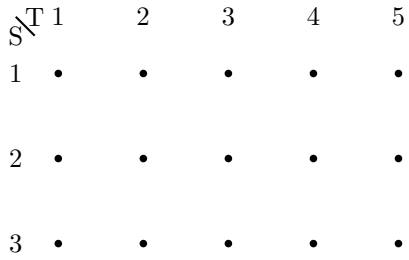
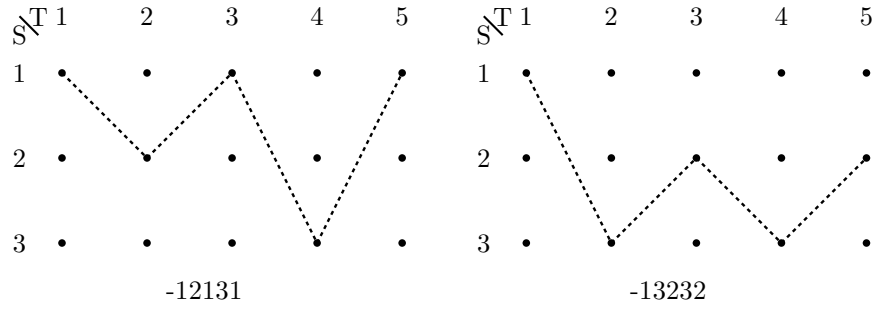
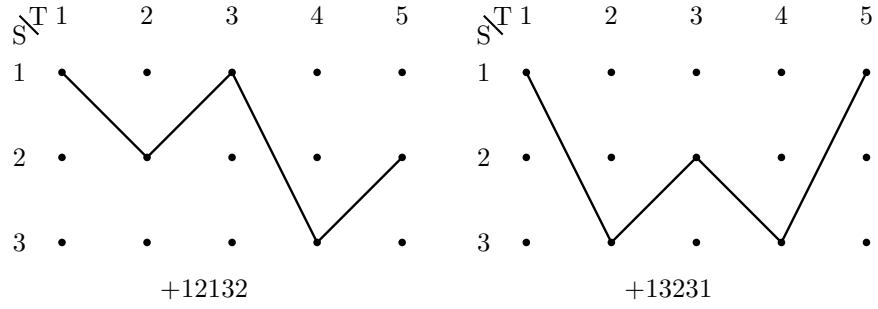
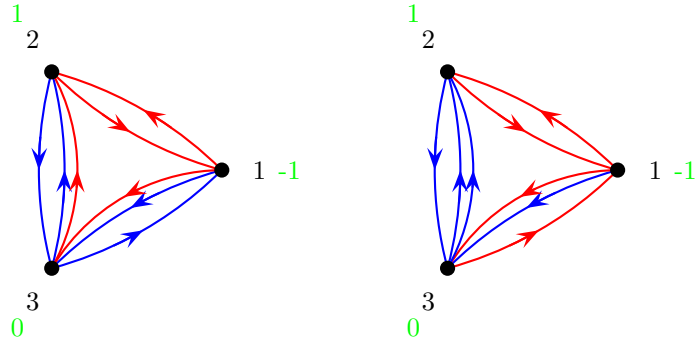
$$-x_{1,2,3,1,2} * x_{3,1,3,2,1} + x_{3,1,2,1,2} * x_{1,3,2,3,1}$$



Move Graph

31312 12321 31212 13231
 $-x_{3,1,3,1,2} * x_{1,2,3,2,1} + x_{3,1,2,1,2} * x_{1,3,2,3,1}$

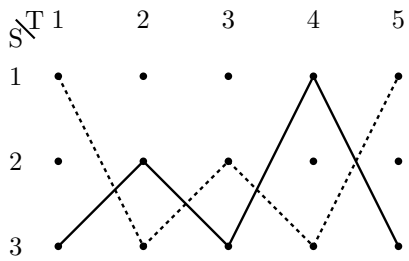
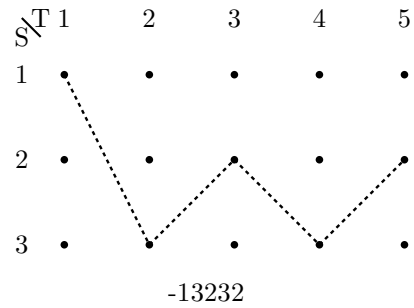
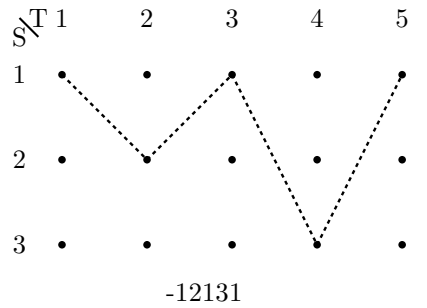
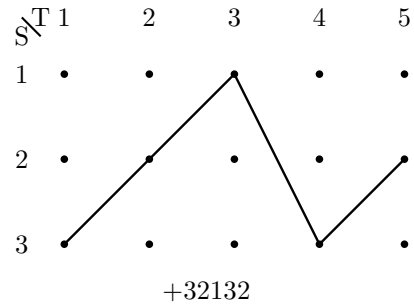
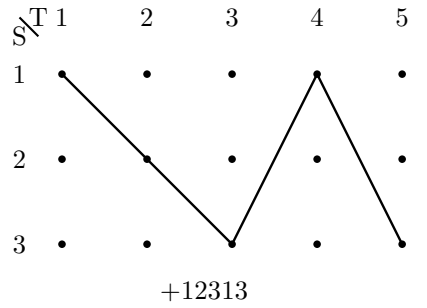
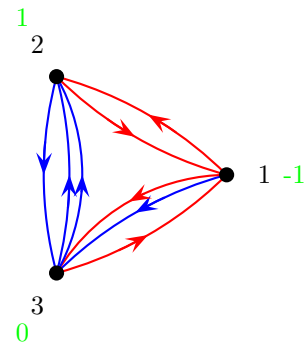
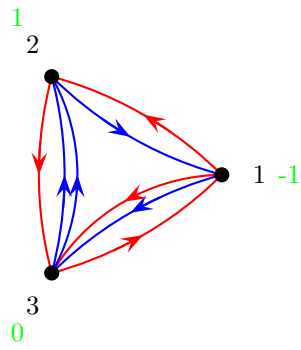
Orbit Size 5



Move Graph

$$12132 \ 13231 \ 12131 \ 13232$$

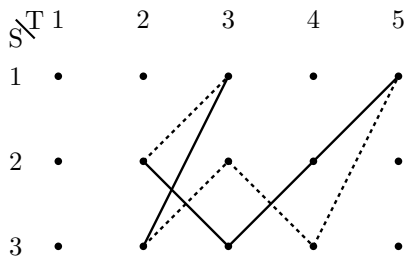
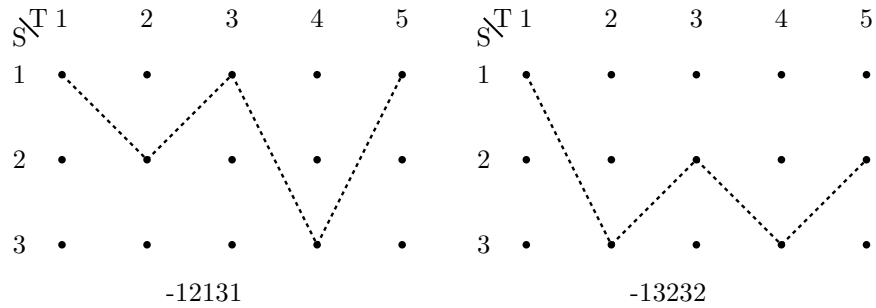
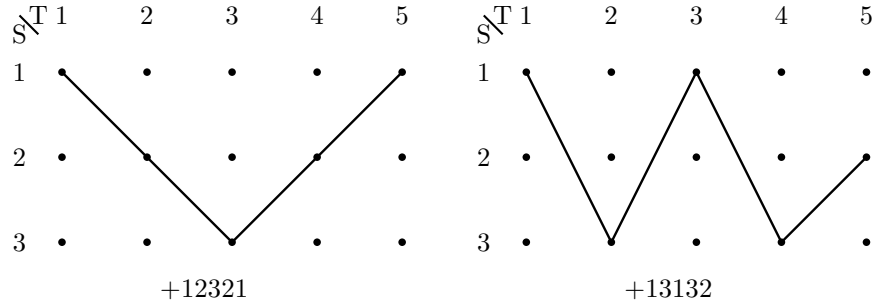
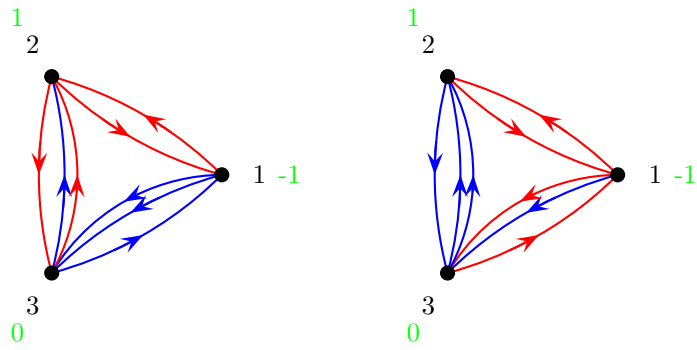
$$-x_{1,2,1,3,2} * x_{1,3,2,3,1} + x_{1,2,1,3,1} * x_{1,3,2,3,2}$$



Move Graph

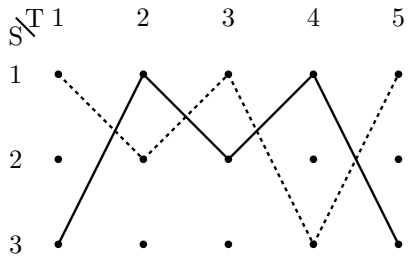
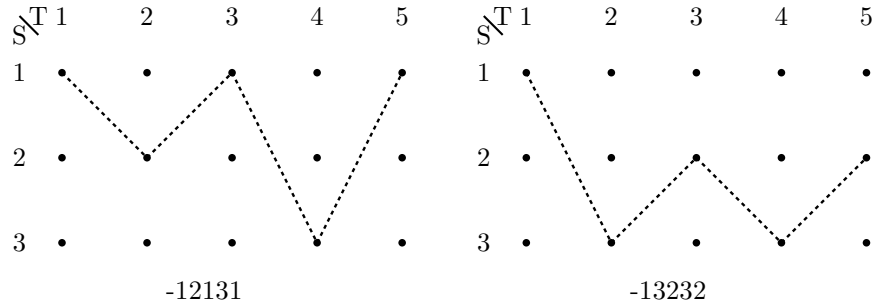
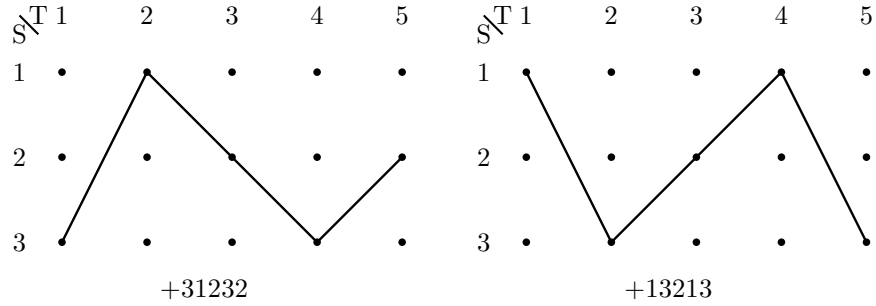
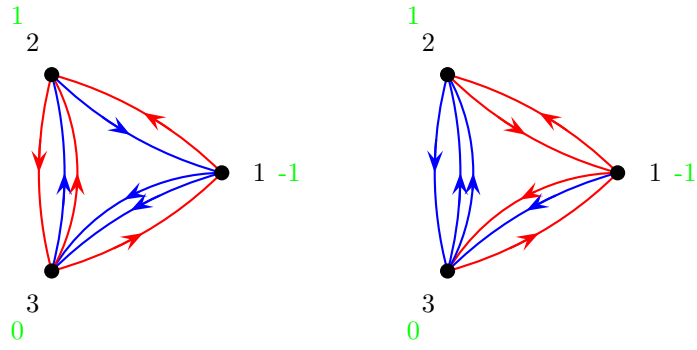
$$12313 \ 32132 \ 12131 \ 13232$$

$$-x_{1,2,3,1,3} * x_{3,2,1,3,2} + x_{1,2,1,3,1} * x_{1,3,2,3,2}$$



Move Graph

12321 13132 12131 13232
 $-x_{1,2,3,2,1} * x_{1,3,1,3,2} + x_{1,2,1,3,1} * x_{1,3,2,3,2}$

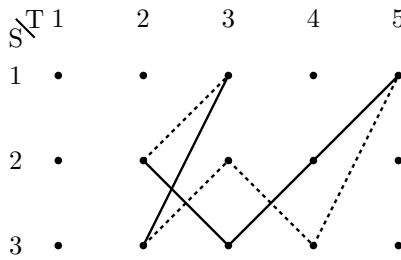
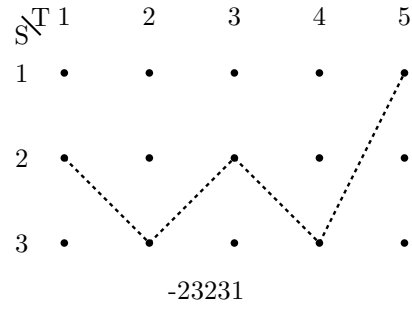
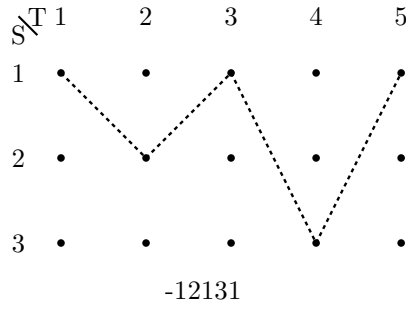
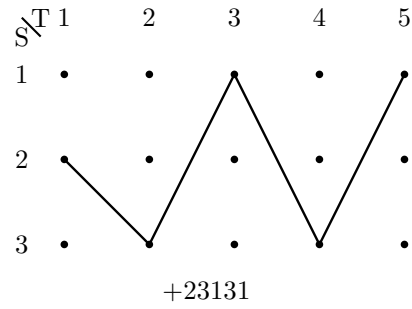
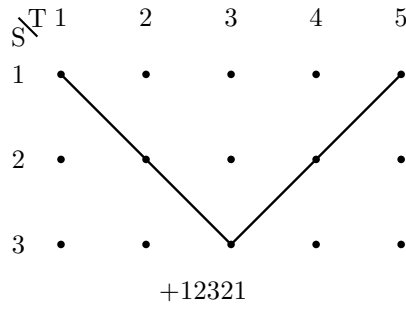
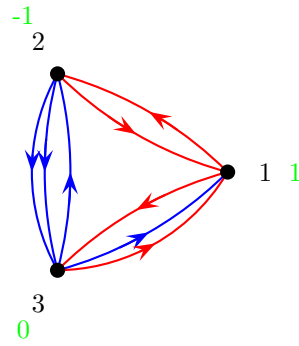
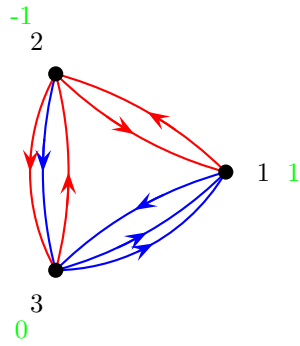


Move Graph

$$31232 \ 13213 \ 12131 \ 13232$$

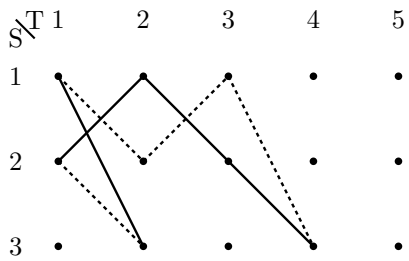
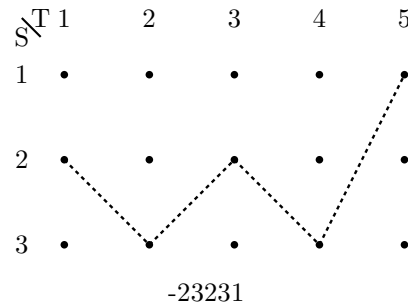
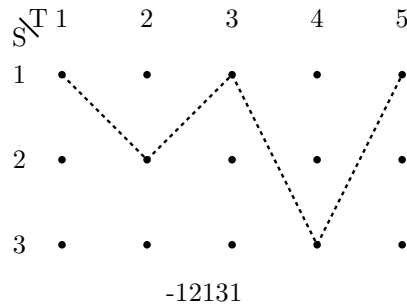
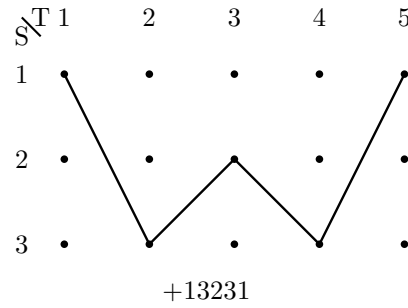
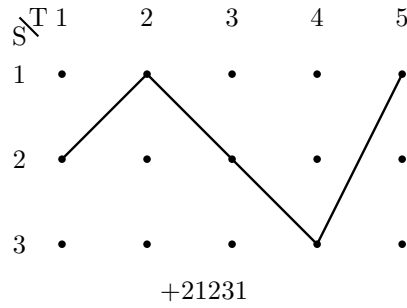
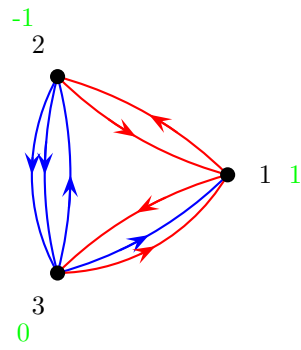
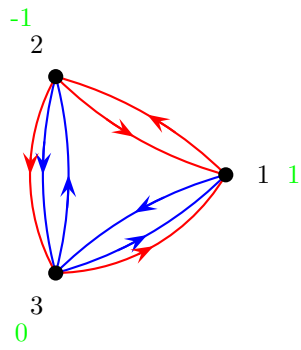
$$-x_{3,1,2,3,2} * x_{1,3,2,1,3} + x_{1,2,1,3,1} * x_{1,3,2,3,2}$$

Orbit Size 5



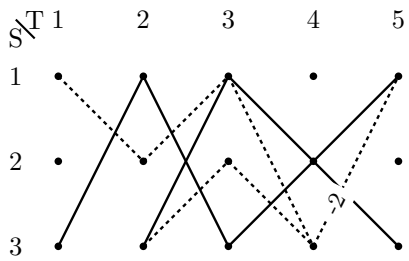
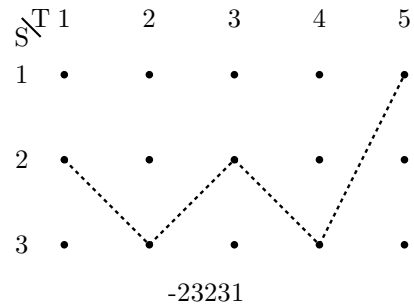
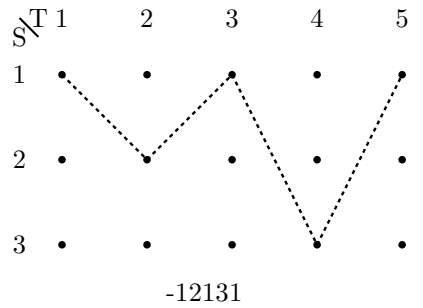
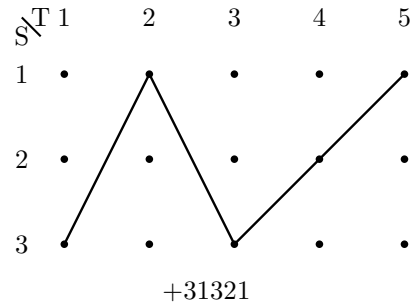
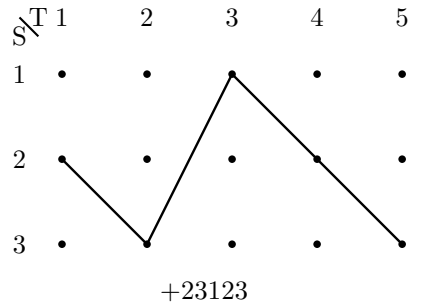
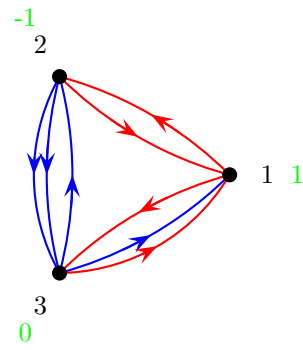
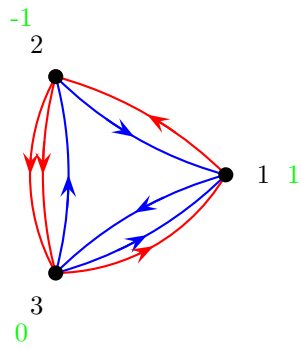
Move Graph

12321 23131 12131 23231
 $-x_{1,2,3,2,1} * x_{2,3,1,3,1} + x_{1,2,1,3,1} * x_{2,3,2,3,1}$



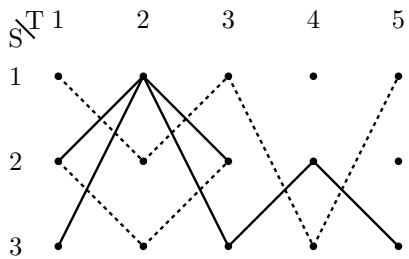
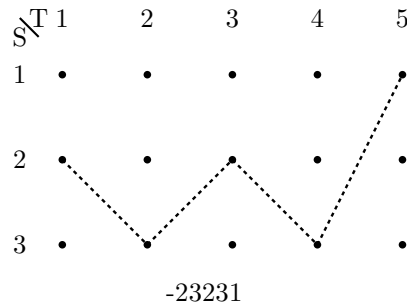
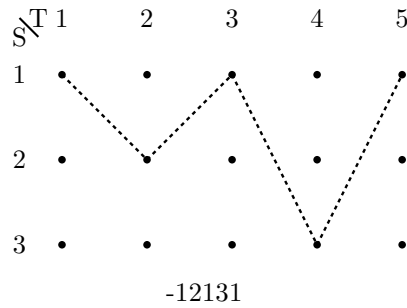
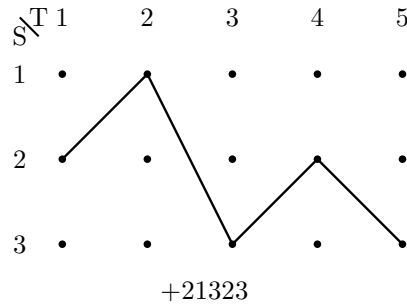
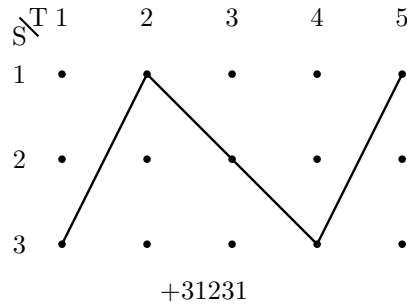
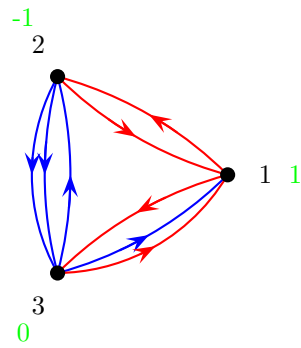
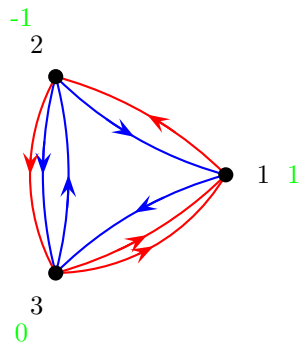
Move Graph

21231 13231 12131 23231
 $-x_{2,1,2,3,1} * x_{1,3,2,3,1} + x_{1,2,1,3,1} * x_{2,3,2,3,1}$



Move Graph

23123 31321 12131 23231
 $-x_{2,3,1,2,3} * x_{3,1,3,2,1} + x_{1,2,1,3,1} * x_{2,3,2,3,1}$

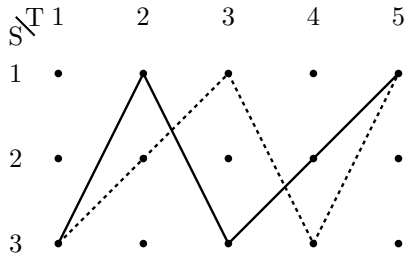
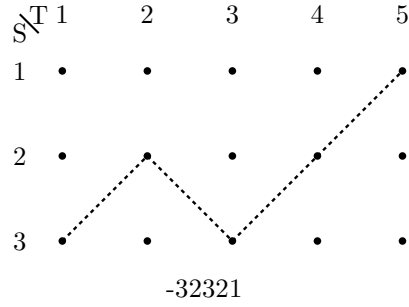
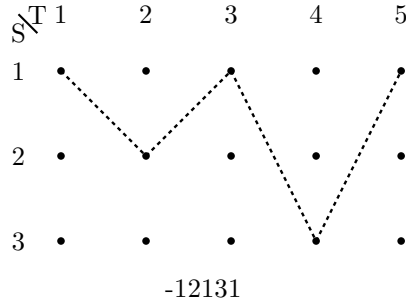
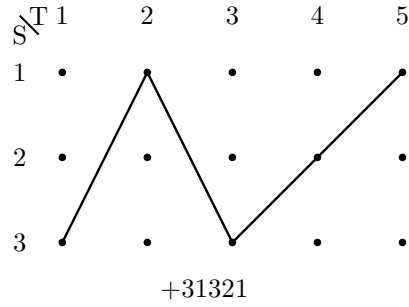
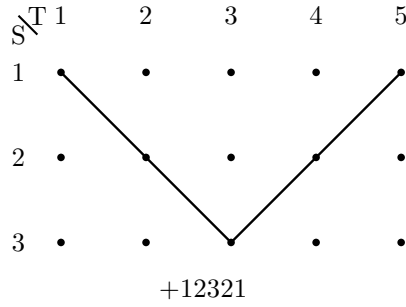
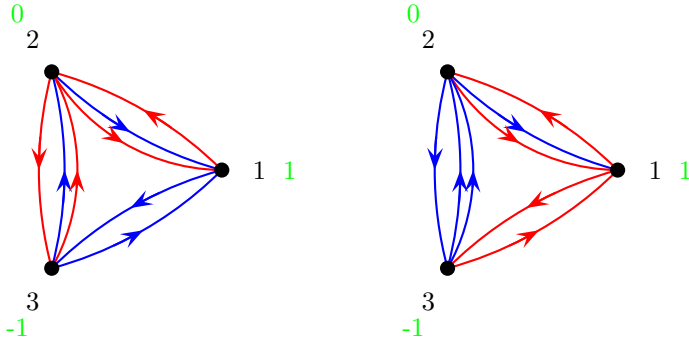


Move Graph

$$31231 \quad 21323 \quad 12131 \quad 23231$$

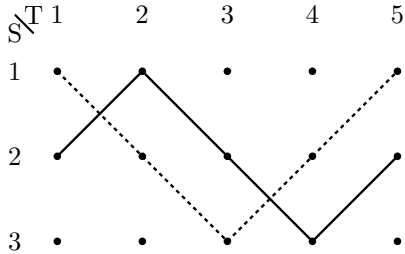
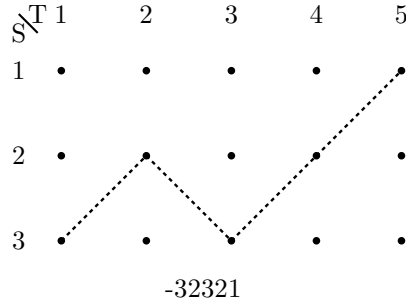
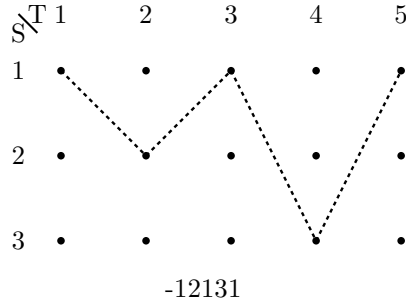
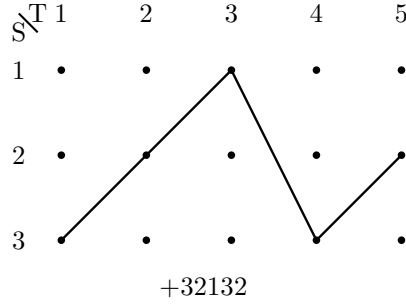
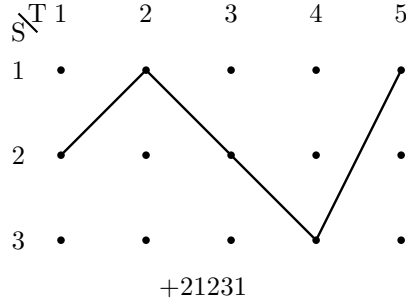
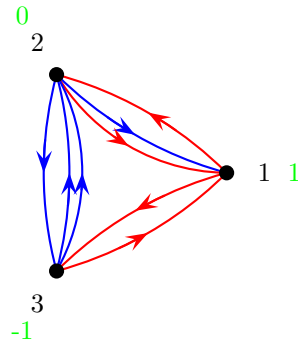
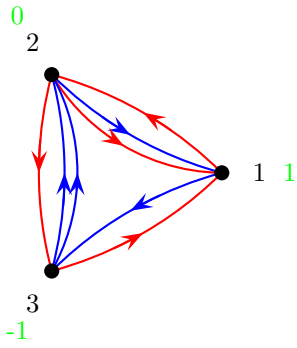
$$-x_{3,1,2,3,1} * x_{2,1,3,2,3} + x_{1,2,1,3,1} * x_{2,3,2,3,1}$$

Orbit Size 5



Move Graph

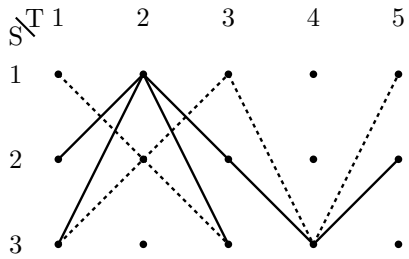
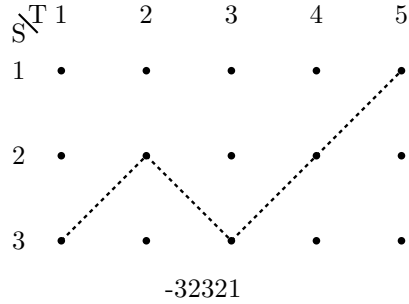
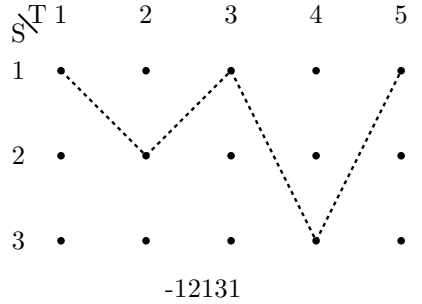
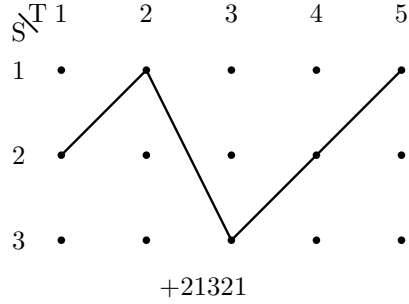
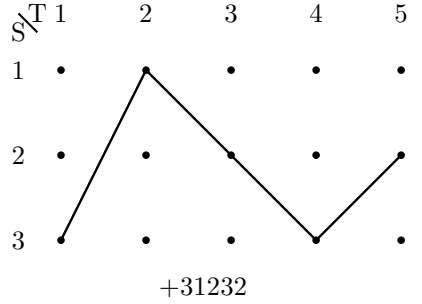
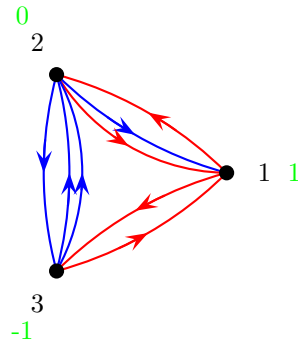
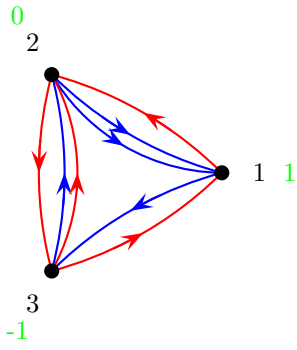
12321 31321 12131 32321
 $-x_{1,2,3,2,1} * x_{3,1,3,2,1} + x_{1,2,1,3,1} * x_{3,2,3,2,1}$



Move Graph

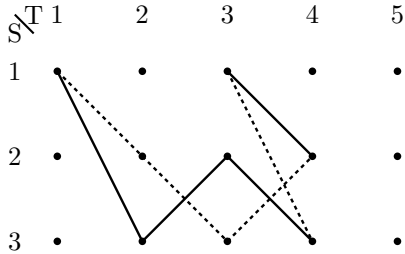
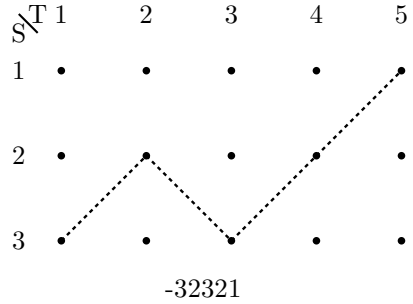
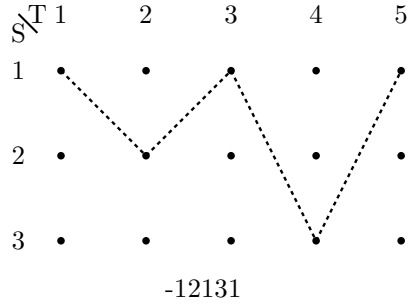
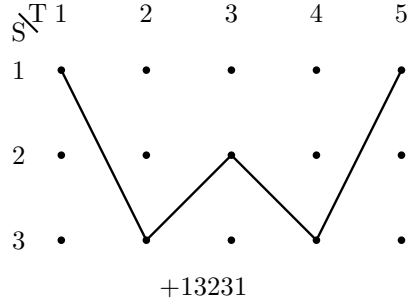
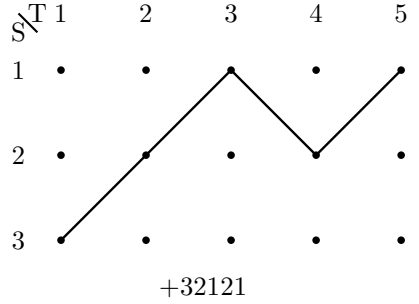
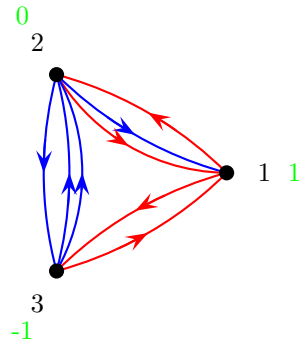
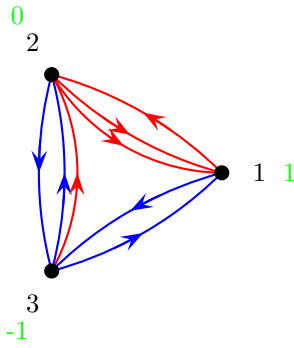
21231 32132 12131 32321

$$-x_{2,1,2,3,1} * x_{3,2,1,3,2} + x_{1,2,1,3,1} * x_{3,2,3,2,1}$$



Move Graph

31232 21321 12131 32321
 $-x_{3,1,2,3,2} * x_{2,1,3,2,1} + x_{1,2,1,3,1} * x_{3,2,3,2,1}$

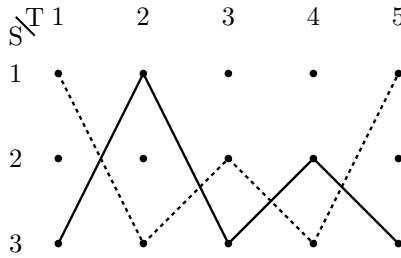
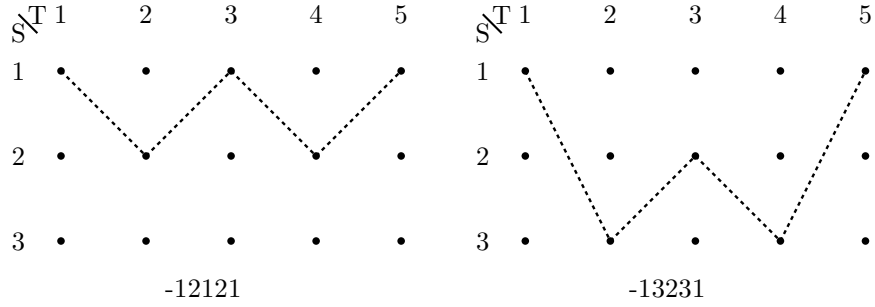
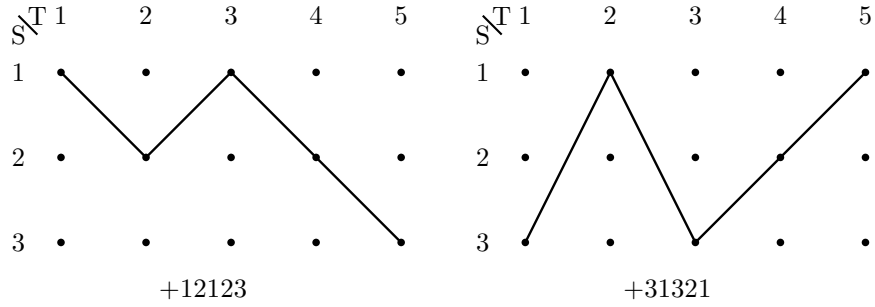
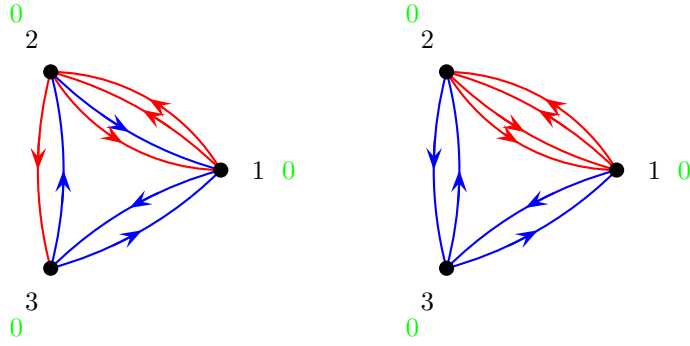


Move Graph

32121 13231 12131 32321

$$-x_{3,2,1,2,1} * x_{1,3,2,3,1} + x_{1,2,1,3,1} * x_{3,2,3,2,1}$$

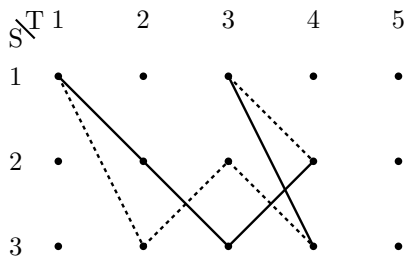
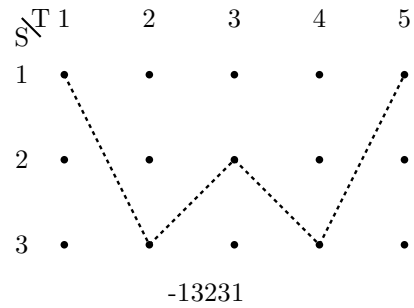
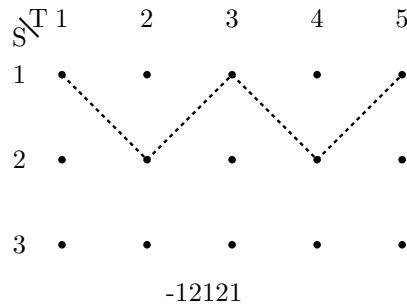
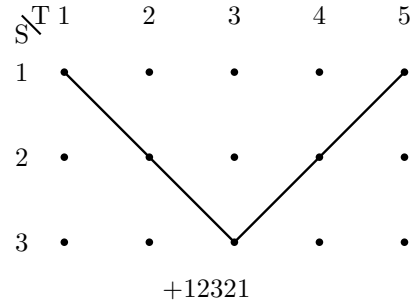
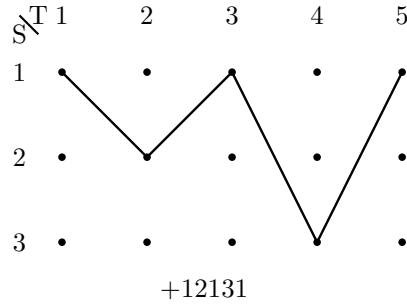
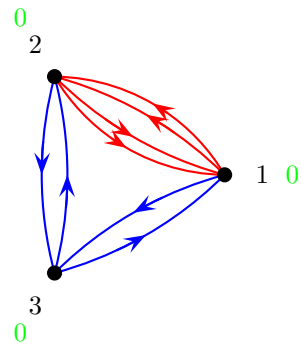
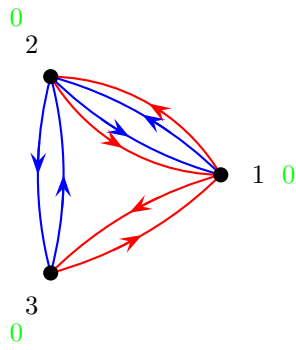
Orbit Size 8



Move Graph

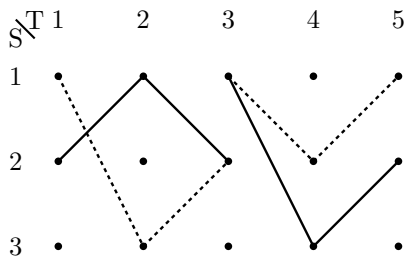
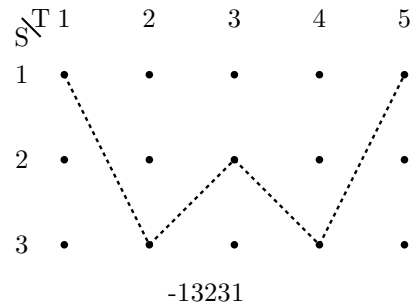
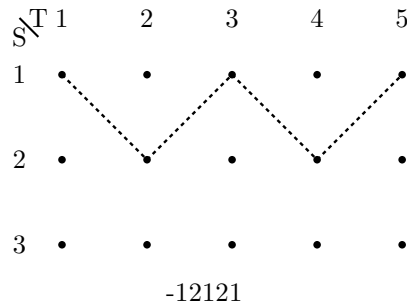
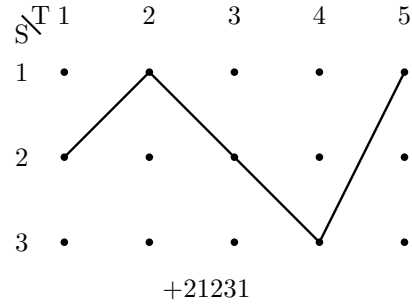
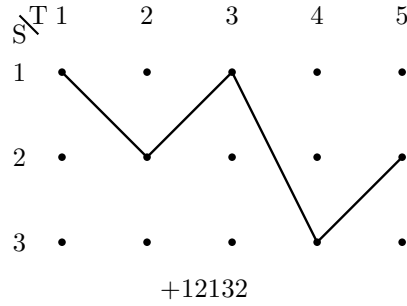
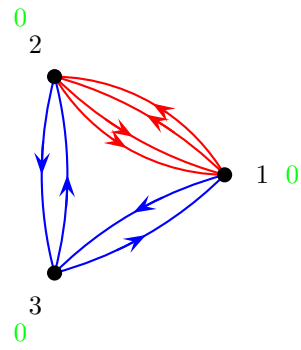
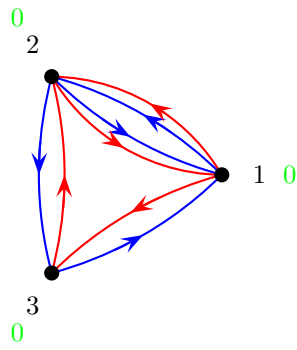
$$12123 \ 31321 \ 12121 \ 13231$$

$$-x_{1,2,1,2,3} * x_{3,1,3,2,1} + x_{1,2,1,2,1} * x_{1,3,2,3,1}$$



Move Graph

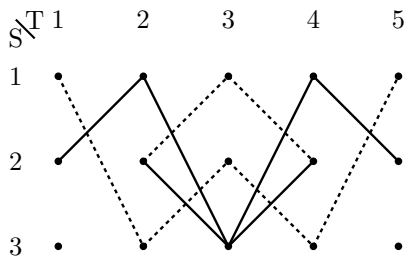
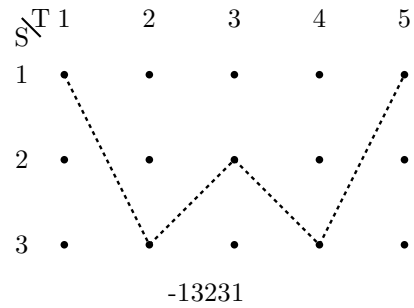
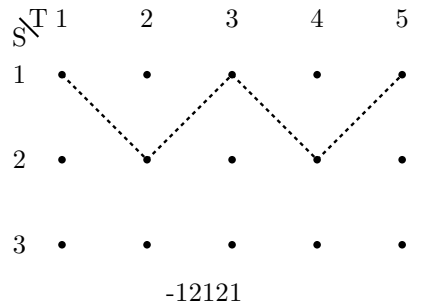
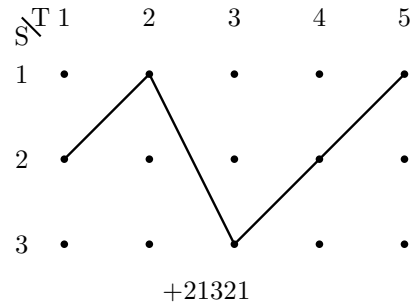
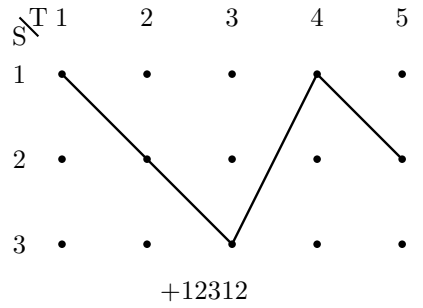
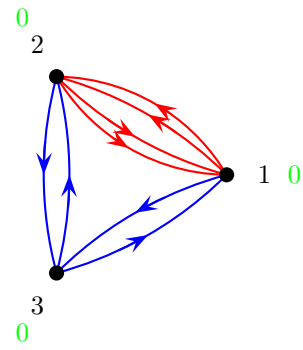
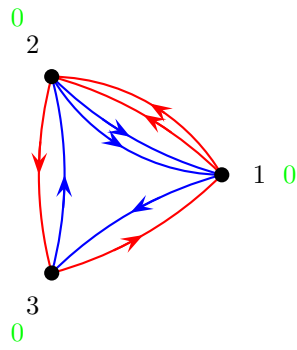
12131 12321 12121 13231
 $-x_{1,2,1,3,1} * x_{1,2,3,2,1} + x_{1,2,1,2,1} * x_{1,3,2,3,1}$



Move Graph

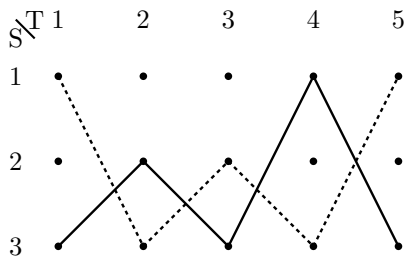
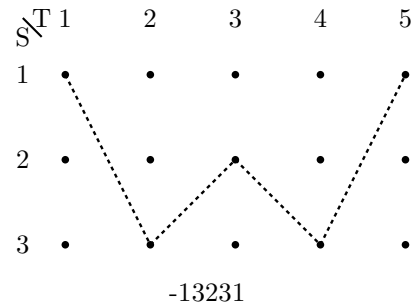
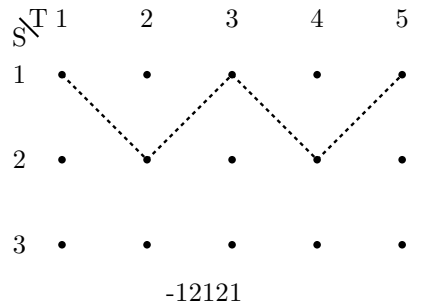
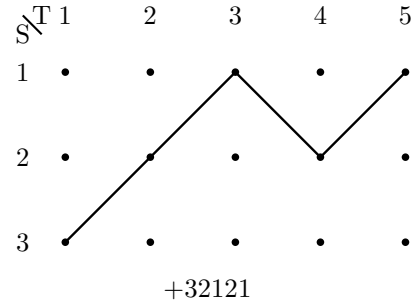
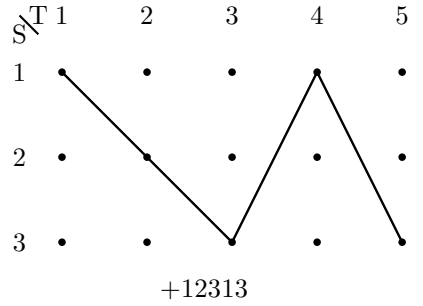
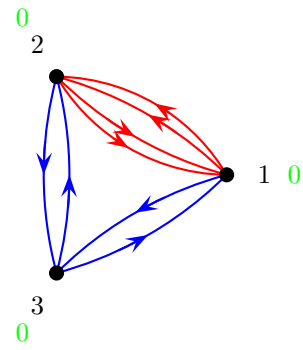
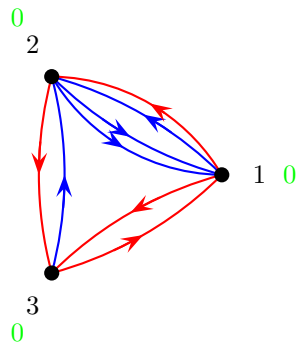
$$12132 \ 21231 \ 12121 \ 13231$$

$$-x_{1,2,1,3,2} * x_{2,1,2,3,1} + x_{1,2,1,2,1} * x_{1,3,2,3,1}$$



Move Graph

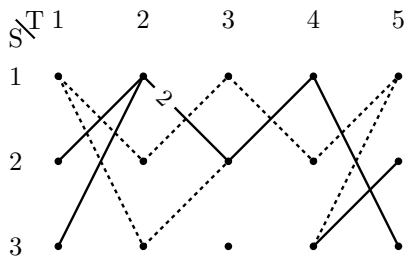
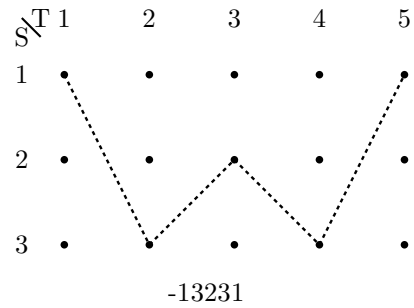
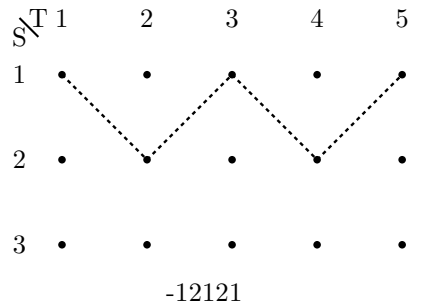
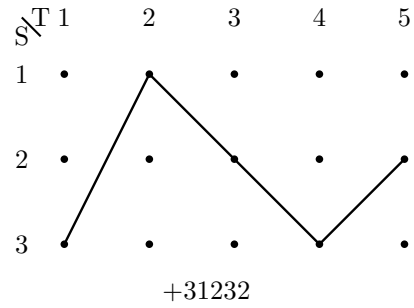
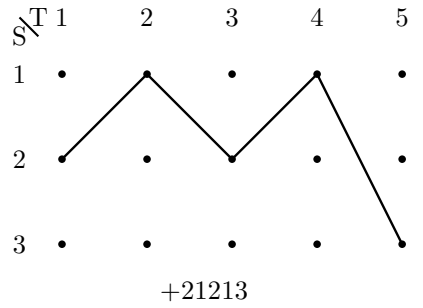
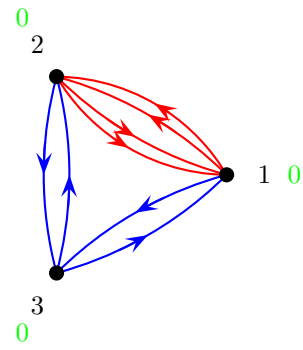
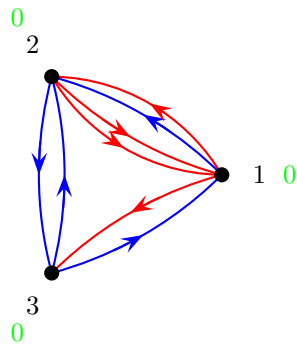
12312 21321 12121 13231
 $-x_{1,2,3,1,2} * x_{2,1,3,2,1} + x_{1,2,1,2,1} * x_{1,3,2,3,1}$



Move Graph

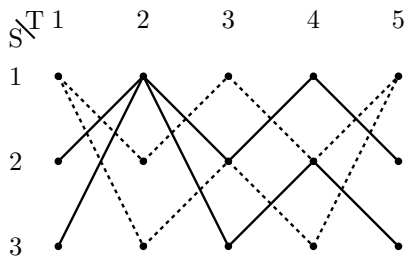
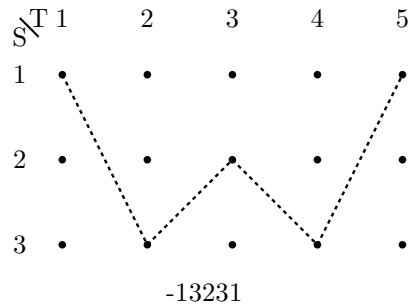
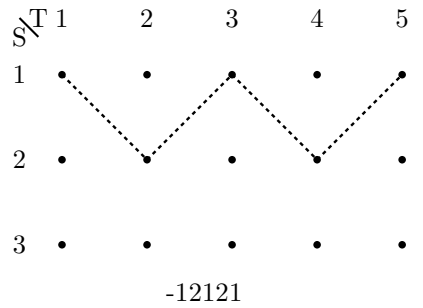
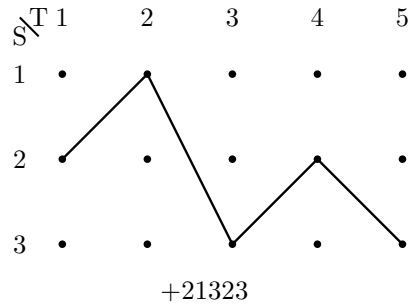
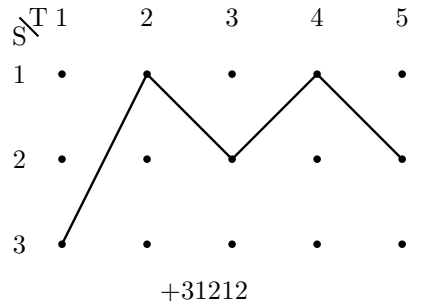
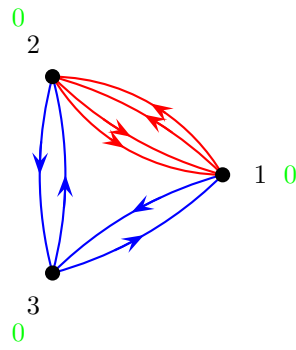
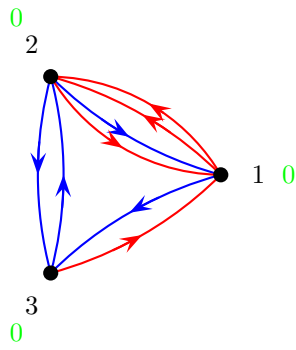
$$12313 \ 32121 \ 12121 \ 13231$$

$$-x_{1,2,3,1,3} * x_{3,2,1,2,1} + x_{1,2,1,2,1} * x_{1,3,2,3,1}$$



Move Graph

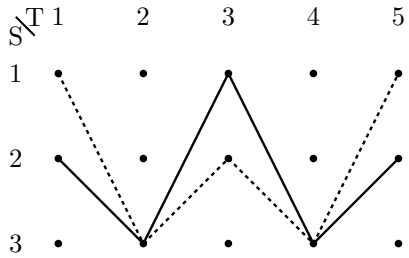
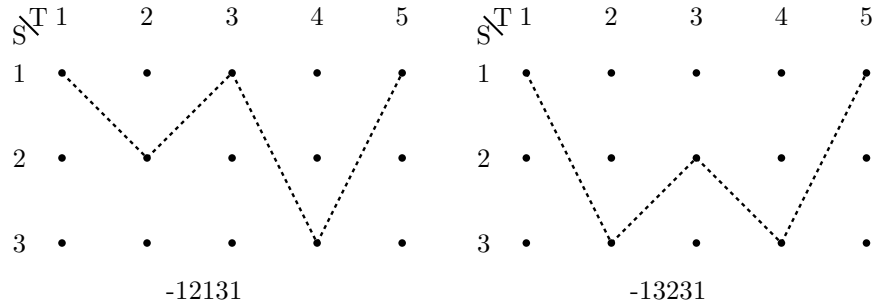
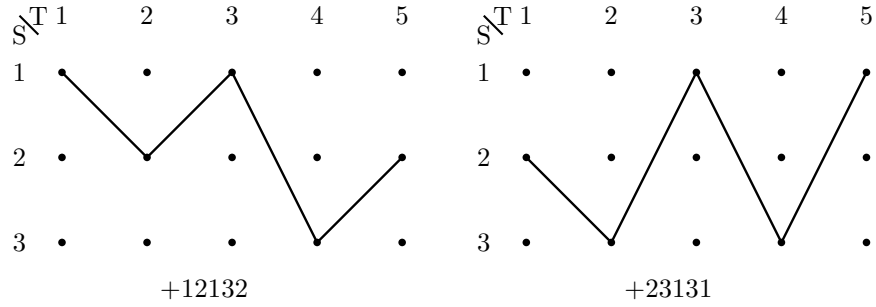
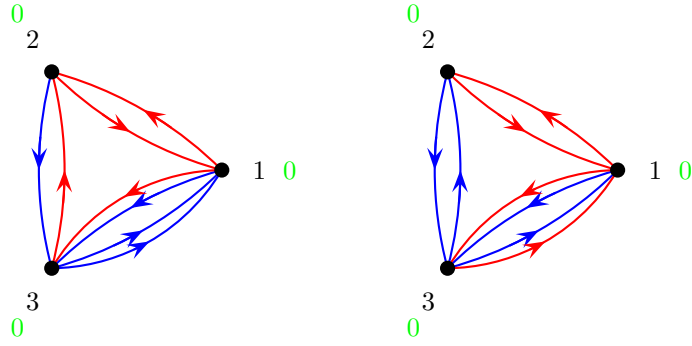
21213 31232 12121 13231
 $-x_{2,1,2,1,3} * x_{3,1,2,3,2} + x_{1,2,1,2,1} * x_{1,3,2,3,1}$



Move Graph

31212 21323 12121 13231
 $-x_{3,1,2,1,2} * x_{2,1,3,2,3} + x_{1,2,1,2,1} * x_{1,3,2,3,1}$

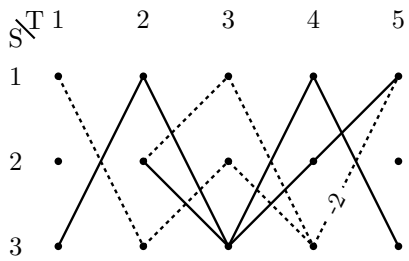
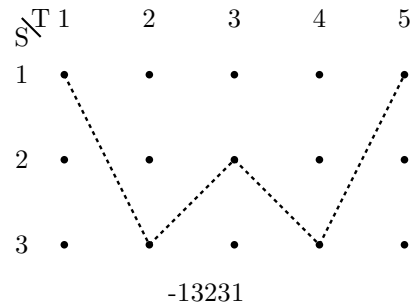
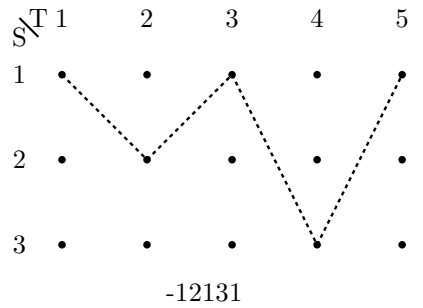
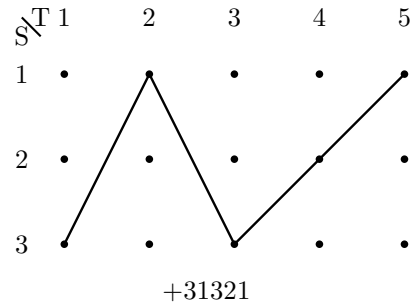
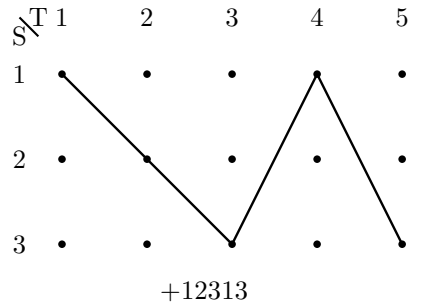
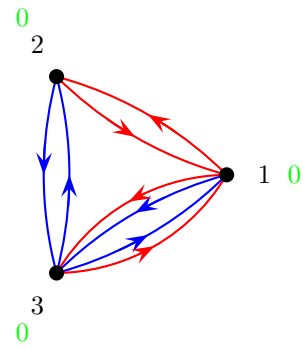
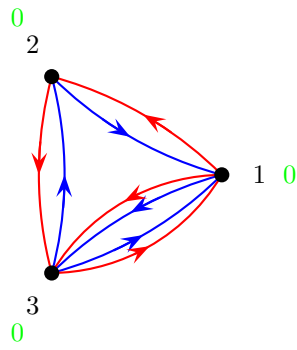
Orbit Size 8



Move Graph

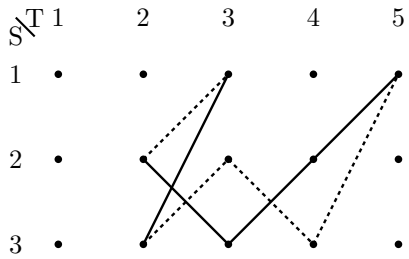
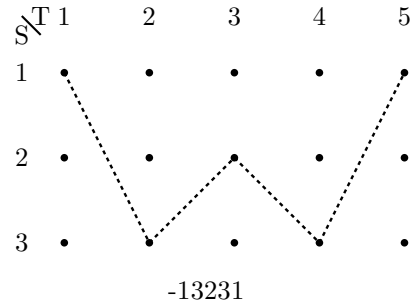
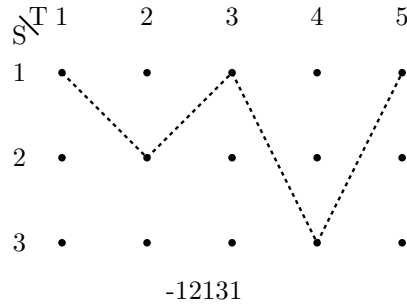
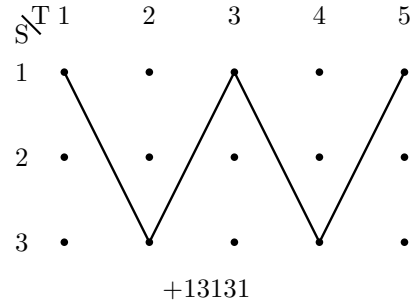
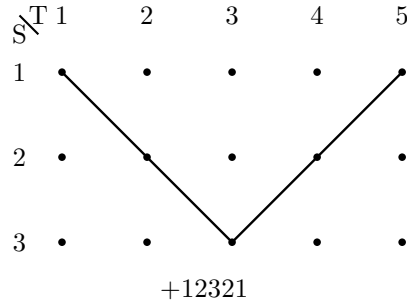
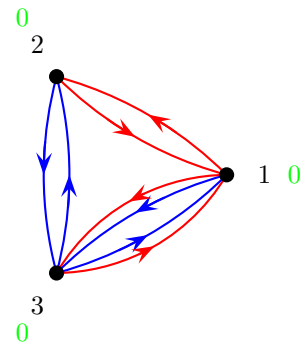
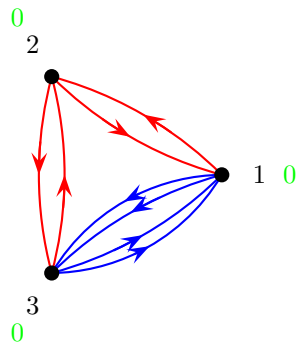
$$12132 \ 23131 \ 12131 \ 13231$$

$$-x_{1,2,1,3,2} * x_{2,3,1,3,1} + x_{1,2,1,3,1} * x_{1,3,2,3,1}$$



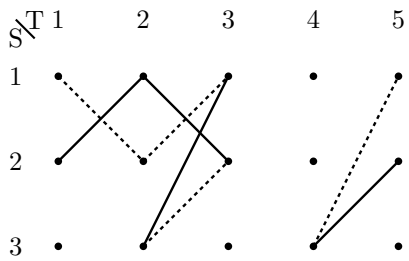
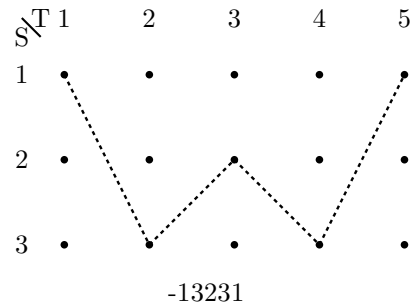
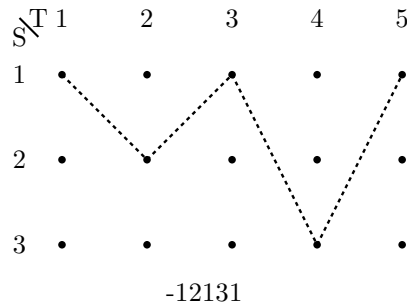
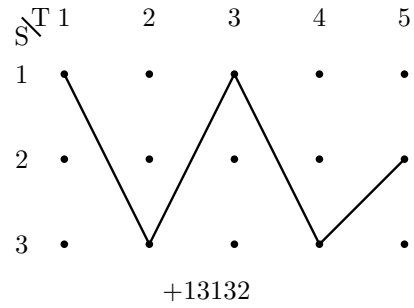
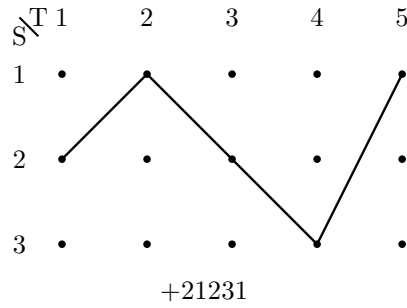
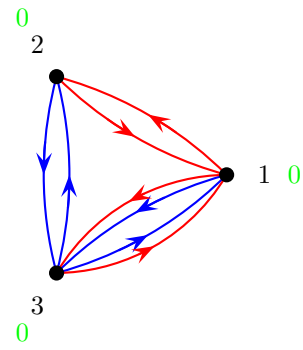
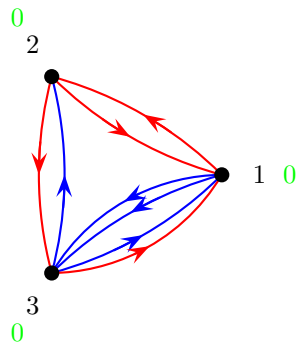
Move Graph

12313 31321 12131 13231
 $-x_{1,2,3,1,3} * x_{3,1,3,2,1} + x_{1,2,1,3,1} * x_{1,3,2,3,1}$



Move Graph

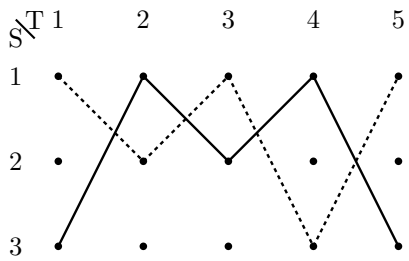
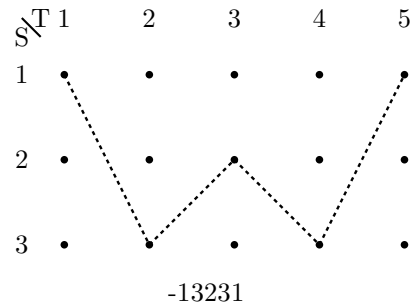
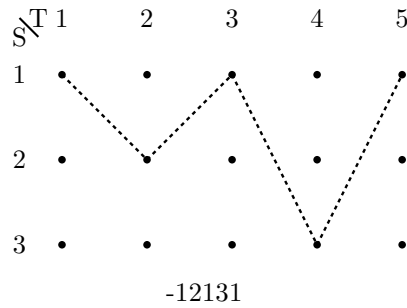
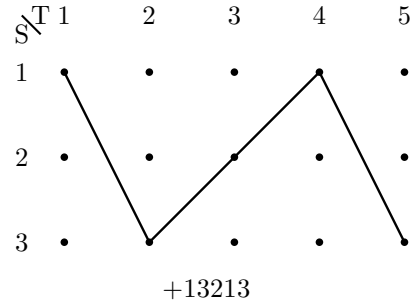
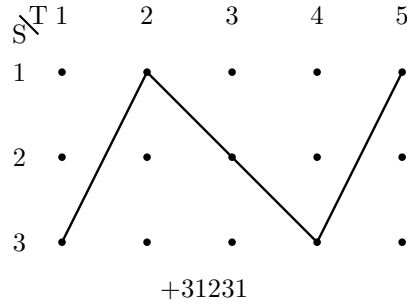
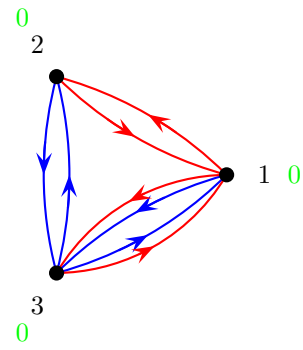
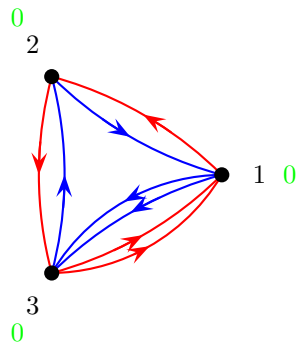
12321 13131 12131 13231
 $-x_{1,2,3,2,1} * x_{1,3,1,3,1} + x_{1,2,1,3,1} * x_{1,3,2,3,1}$



Move Graph

$$21231 \quad 13132 \quad 12131 \quad 13231$$

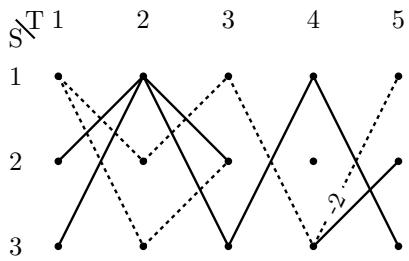
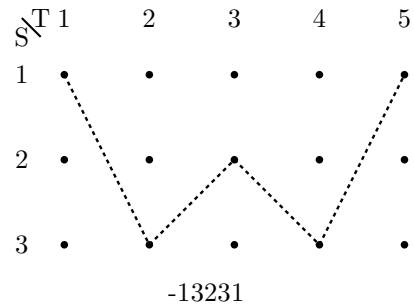
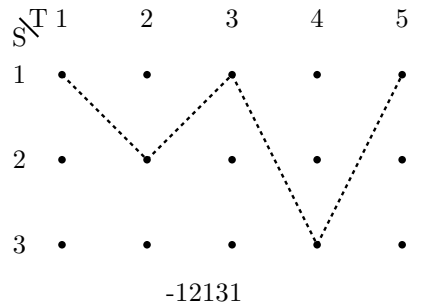
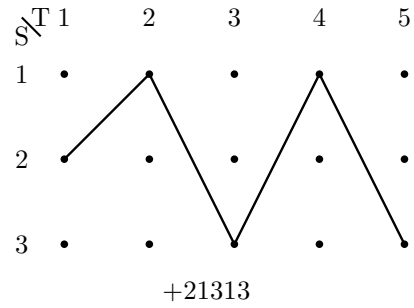
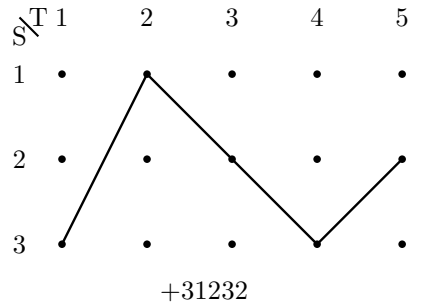
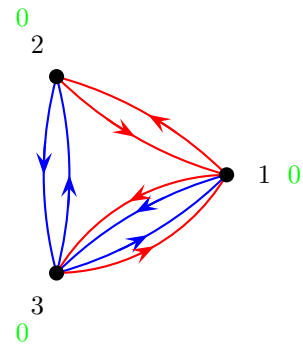
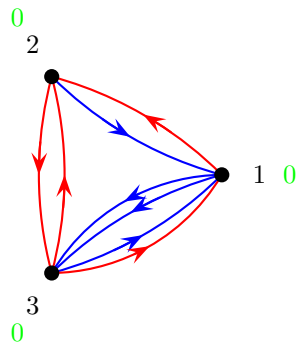
$$-x_{2,1,2,3,1} * x_{1,3,1,3,2} + x_{1,2,1,3,1} * x_{1,3,2,3,1}$$



Move Graph

31231 13213 12131 13231

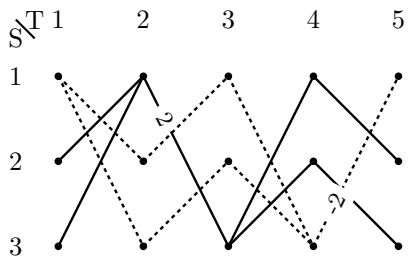
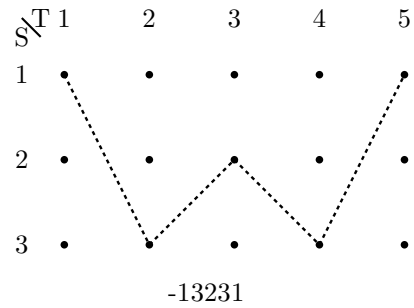
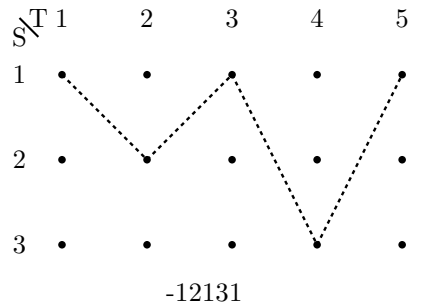
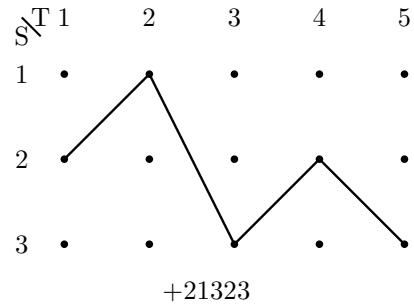
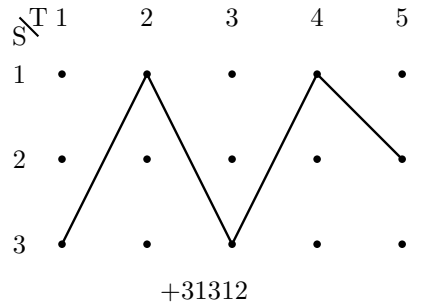
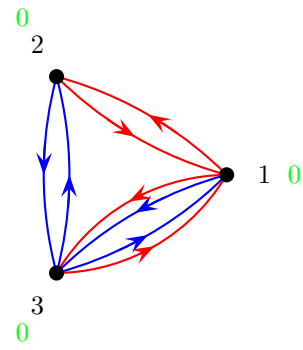
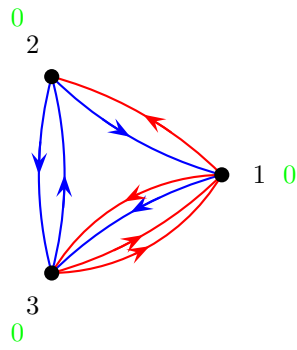
$$-x_{3,1,2,3,1} * x_{1,3,2,1,3} + x_{1,2,1,3,1} * x_{1,3,2,3,1}$$



Move Graph

31232 21313 12131 13231

$$-x_{3,1,2,3,2} * x_{2,1,3,1,3} + x_{1,2,1,3,1} * x_{1,3,2,3,1}$$

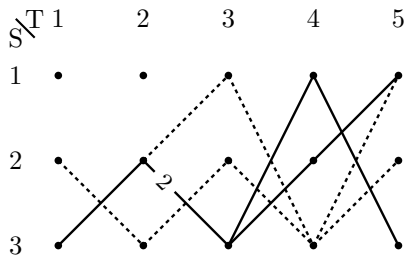
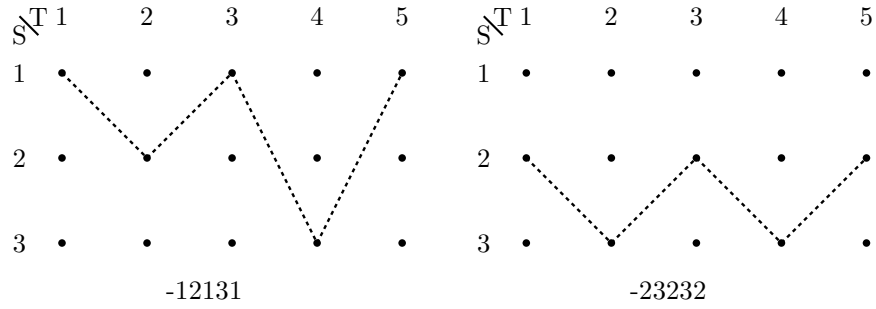
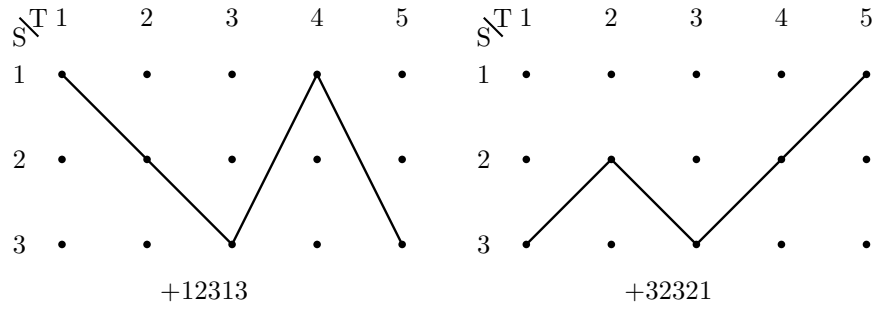
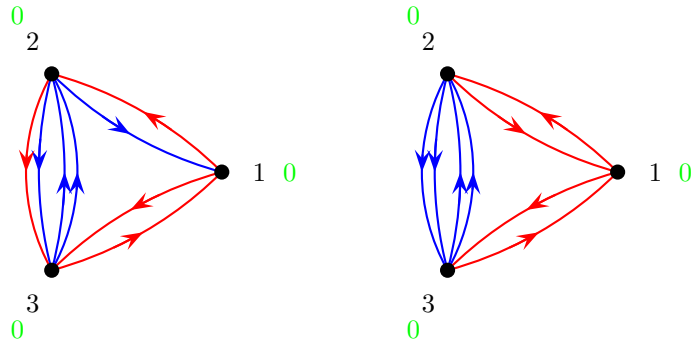


Move Graph

31312 21323 12131 13231

$$-x_{3,1,3,1,2} * x_{2,1,3,2,3} + x_{1,2,1,3,1} * x_{1,3,2,3,1}$$

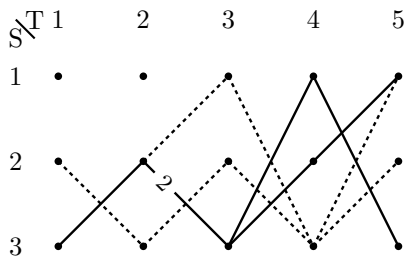
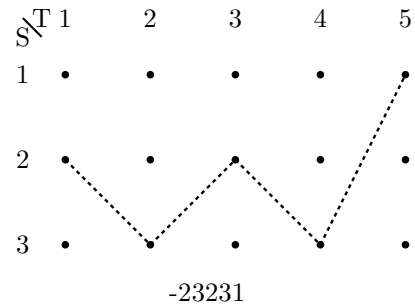
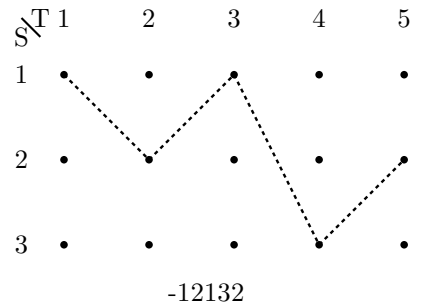
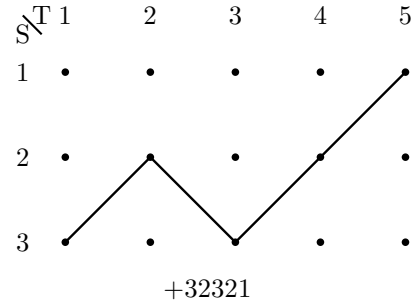
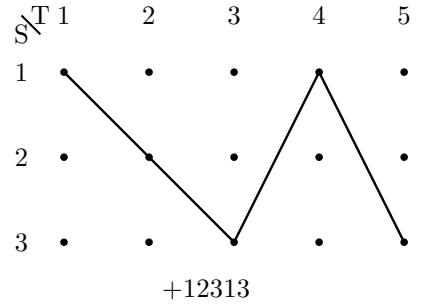
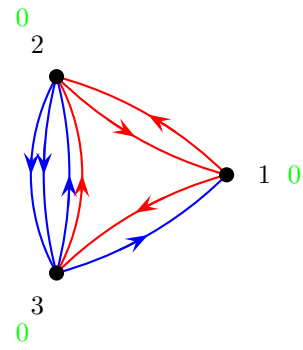
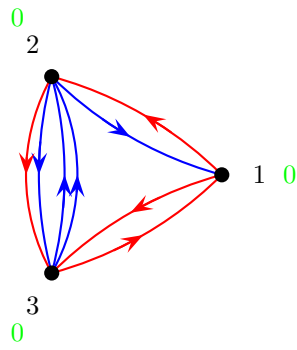
Orbit Size 8



Move Graph

$$12313 \ 32321 \ 12131 \ 23232$$

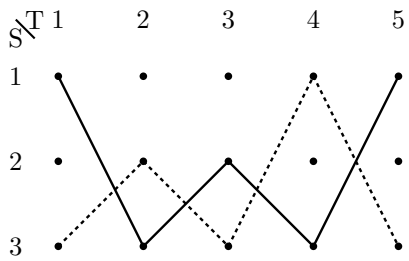
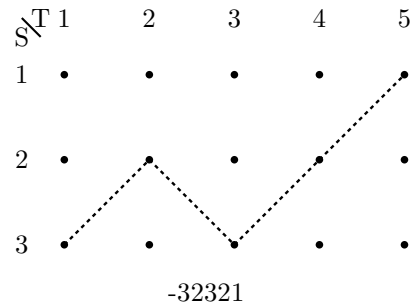
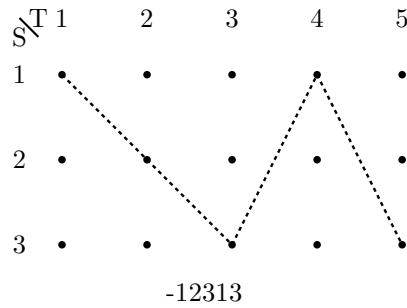
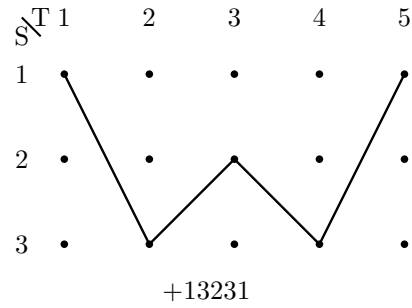
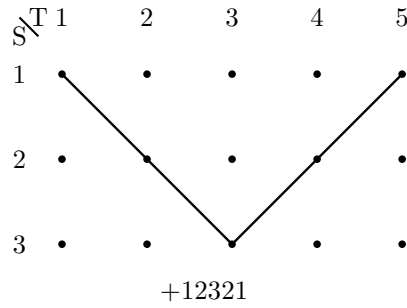
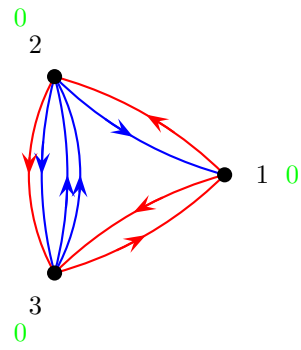
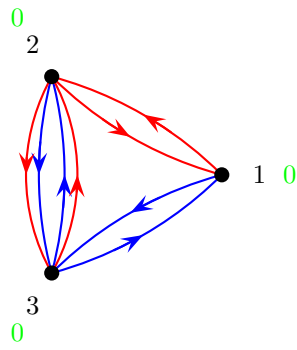
$$-x_{1,2,3,1,3} * x_{3,2,3,2,1} + x_{1,2,1,3,1} * x_{2,3,2,3,2}$$



Move Graph

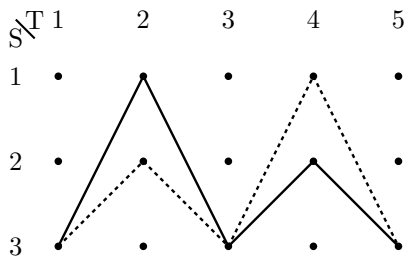
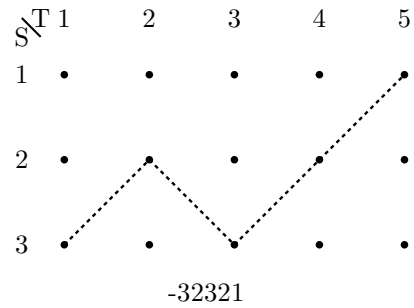
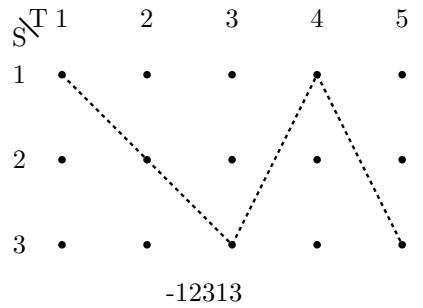
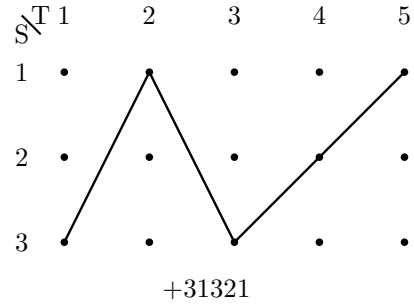
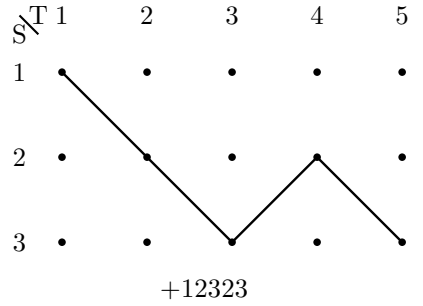
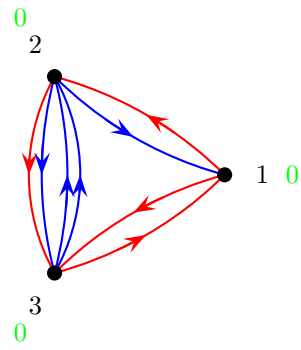
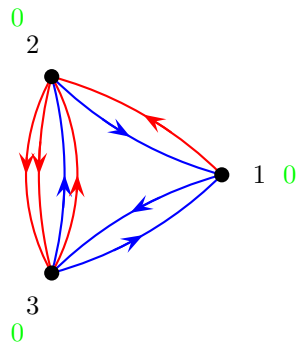
12313 32321 12132 23231

$$-x_{1,2,3,1,3} * x_{3,2,3,2,1} + x_{1,2,1,3,2} * x_{2,3,2,3,1}$$



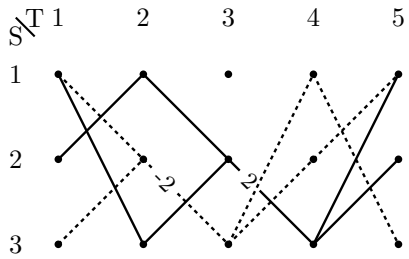
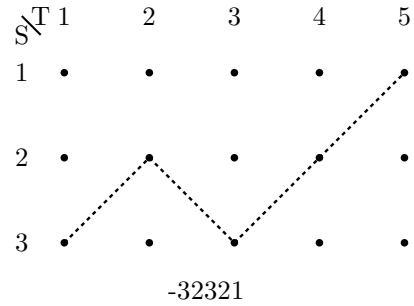
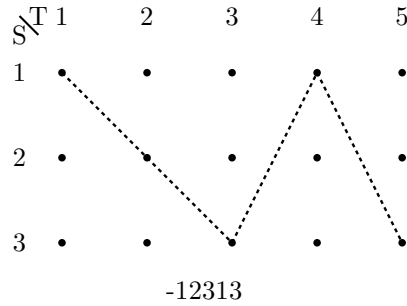
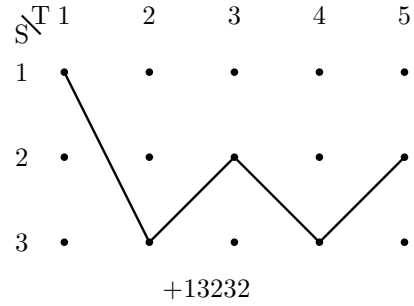
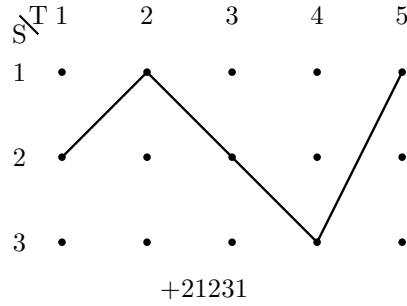
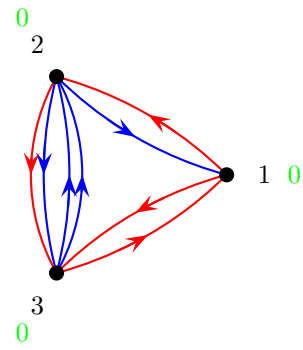
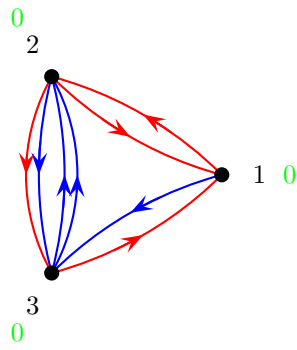
Move Graph

12321 13231 12313 32321
 $-x_{1,2,3,2,1} * x_{1,3,2,3,1} + x_{1,2,3,1,3} * x_{3,2,3,2,1}$



Move Graph

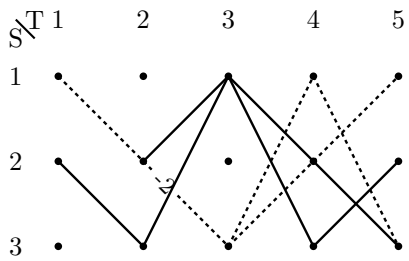
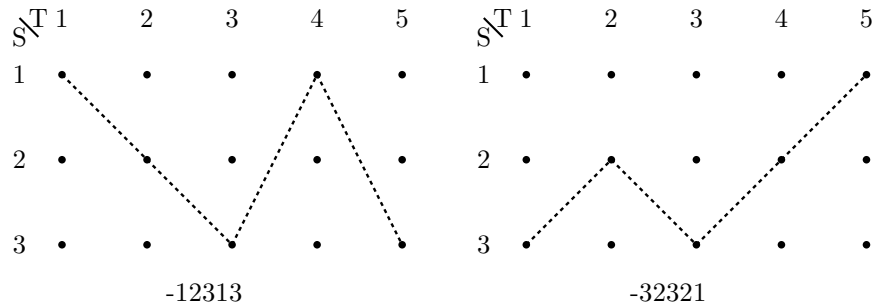
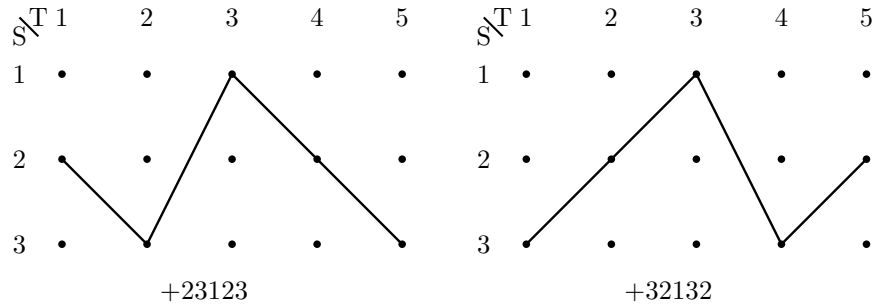
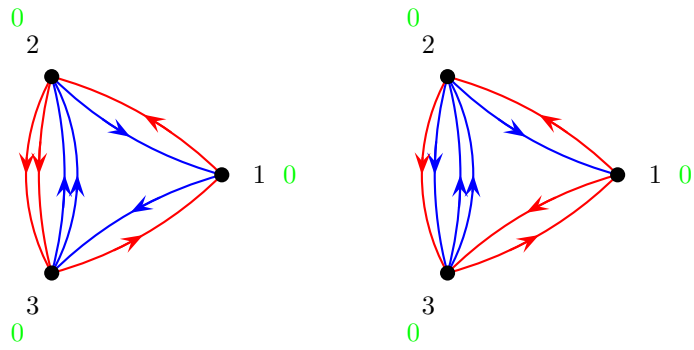
12323 31321 12313 32321
 $-x_{1,2,3,2,3} * x_{3,1,3,2,1} + x_{1,2,3,1,3} * x_{3,2,3,2,1}$



Move Graph

$$21231 \ 13232 \ 12313 \ 32321$$

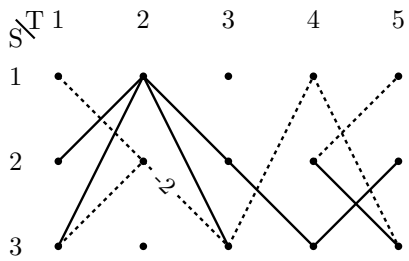
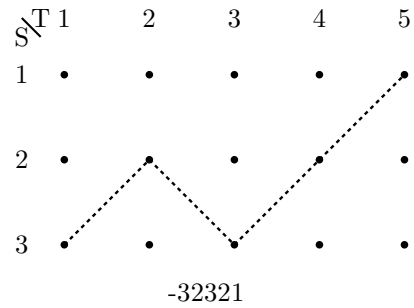
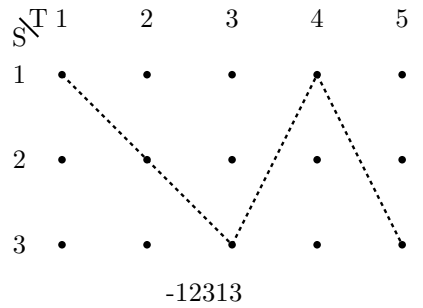
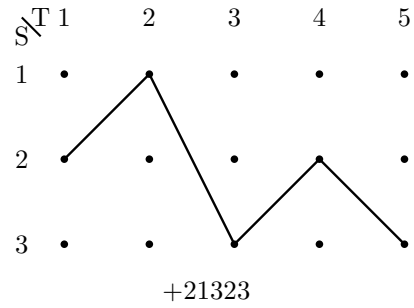
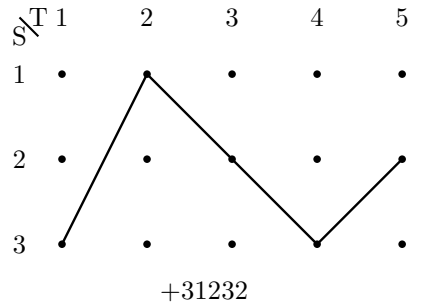
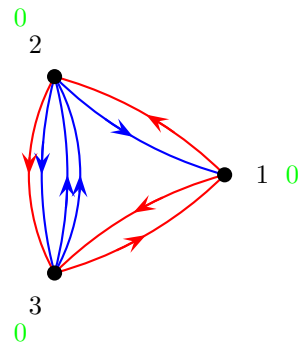
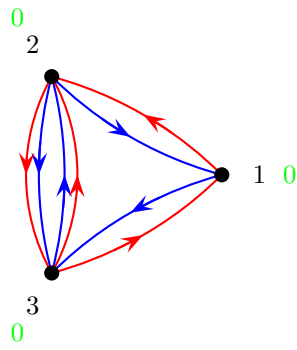
$$-x_{2,1,2,3,1} * x_{1,3,2,3,2} + x_{1,2,3,1,3} * x_{3,2,3,2,1}$$



Move Graph

$$23123 \ 32132 \ 12313 \ 32321$$

$$-x_{2,3,1,2,3} * x_{3,2,1,3,2} + x_{1,2,3,1,3} * x_{3,2,3,2,1}$$



Move Graph

31232 21323 12313 32321

$$-x_{3,1,2,3,2} * x_{2,1,3,2,3} + x_{1,2,3,1,3} * x_{3,2,3,2,1}$$