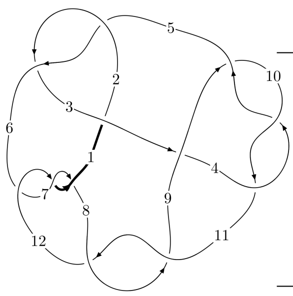
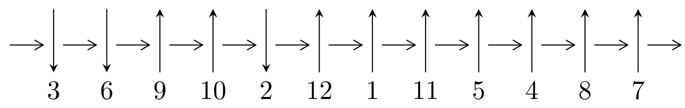
# $12a_{0376}$ $(K12a_{0376})$




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

$$4,11 \xrightarrow[c_{10}]{} 10 \xrightarrow[c_4]{} 2,5 \xrightarrow[c_5]{} 6 \xrightarrow[c_9]{} 9 \xrightarrow[c_3]{} 3 \xrightarrow[c_1]{} 1 \xrightarrow[c_8]{} 8 \xrightarrow[c_{11}]{} 12 \xrightarrow[c_7]{} 7 \twoheadrightarrow c_2, c_6, c_{12}$$

**Ideals for irreducible components[2] of $X_{\mathbf{par}}$**

$$I_1^u = \langle -u^{46} - 22u^{44} + \cdots + 4b - 4u,\ u^{46} + 21u^{44} + \cdots + 4a + 2,\ u^{49} - 2u^{48} + \cdots + 4u - 2\rangle$$

$$\begin{aligned} I_2^u = \langle &-15a^2u^2 - 8a^2u + 29u^2a - 35a^2 + 25au + 26u^2 + 22b + 86a + 8u + 46, \\ &a^3 - 4u^2a - 2a^2 - 5au - u^2 + 5u - 3,\ u^3 + 2u - 1\rangle \end{aligned}$$

$$\begin{aligned} I_3^u = \langle &11u^3a^2 - 2a^2u^2 + 23u^3a + 14a^2u - 18u^2a - 26u^3 + 2a^2 + 31au - 16u^2 + 19b - a - 40u - 22, \\ &a^3 + 2a^2u + u^2a + 2a^2 + 5au + 2u^2 - u - 1,\ u^4 + u^3 + 2u^2 + 2u + 1\rangle \end{aligned}$$

$$I_4^u = \langle b - u + 1,\ 2a + 3u - 2,\ u^2 + 2\rangle$$

$$I_1^v = \langle a,\ b + 1,\ v - 1\rangle$$

* 5 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 73 representations.

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[1] The image of knot diagram is generated by the software "**Draw programme**" developed by Andrew Bartholomew(`http://www.layer8.co.uk/maths/draw/index.htm#Running-draw`), where we modified some parts for our purpose(`https://github.com/CATsTAILs/LinksPainter`).

[2] All coefficients of polynomials are rational numbers. But the coefficients are sometimes approximated in decimal forms when there is not enough margin.

## I. $I^u_1 =$ $\langle -u^{46} - 22u^{44} + \cdots + 4b - 4u,\ u^{46} + 21u^{44} + \cdots + 4a + 2,\ u^{49} - 2u^{48} + \cdots + 4u - 2\rangle$

**(i) Arc colorings**

$$a_4 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} -\frac{1}{4}u^{46} - \frac{21}{4}u^{44} + \cdots - \frac{1}{2}u - \frac{1}{2} \\ \frac{1}{4}u^{46} + \frac{11}{2}u^{44} + \cdots + 7u^4 + u \end{pmatrix}$$
$$a_5 = \begin{pmatrix} u \\ u^3 + u \end{pmatrix}$$
$$a_6 = \begin{pmatrix} -\frac{1}{2}u^{48} + u^{47} + \cdots + u - \frac{1}{2} \\ u^{48} - u^{47} + \cdots - \frac{3}{2}u + 1 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} u^2 + 1 \\ u^4 + 2u^2 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} -u^5 - 2u^3 - u \\ -u^7 - 3u^5 - 2u^3 + u \end{pmatrix}$$
$$a_1 = \begin{pmatrix} -\frac{1}{2}u^{48} + u^{47} + \cdots + 2u - \frac{3}{2} \\ \frac{3}{4}u^{45} + \frac{63}{4}u^{43} + \cdots + \frac{1}{2}u - 1 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} -u^4 - u^2 + 1 \\ u^4 + 2u^2 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} u^8 + 3u^6 + u^4 - 2u^2 + 1 \\ -u^8 - 4u^6 - 4u^4 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} -\frac{1}{4}u^{39} - \frac{9}{2}u^{37} + \cdots + \frac{1}{2}u + 1 \\ -\frac{1}{4}u^{41} - \frac{19}{4}u^{39} + \cdots + \frac{5}{2}u^2 + \frac{1}{2}u \end{pmatrix}$$

**(ii) Obstruction class** $= -1$

**(iii) Cusp Shapes** $= 2u^{48} - 4u^{47} + \cdots - 2u + 8$

**(iv) u-Polynomials at the component**

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{49} + 26u^{48} + \cdots + 85u + 9$ |
| $c_2, c_5$ | $u^{49} + 2u^{48} + \cdots - 5u - 3$ |
| $c_3$ | $u^{49} + 2u^{48} + \cdots + 796u - 202$ |
| $c_4, c_9, c_{10}$ | $u^{49} - 2u^{48} + \cdots + 4u - 2$ |
| $c_6, c_7, c_{12}$ | $u^{49} - 2u^{48} + \cdots - 9u - 3$ |
| $c_8, c_{11}$ | $u^{49} + 6u^{48} + \cdots - 672u - 144$ |

**(v) Riley Polynomials at the component**

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{49} - 2y^{48} + \cdots + 1321y - 81$ |
| $c_2, c_5$ | $y^{49} - 26y^{48} + \cdots + 85y - 9$ |
| $c_3$ | $y^{49} + 22y^{48} + \cdots - 274576y - 40804$ |
| $c_4, c_9, c_{10}$ | $y^{49} + 46y^{48} + \cdots + 8y - 4$ |
| $c_6, c_7, c_{12}$ | $y^{49} - 42y^{48} + \cdots - 123y - 9$ |
| $c_8, c_{11}$ | $y^{49} + 42y^{48} + \cdots - 46080y - 20736$ |

**(vi) Complex Volumes and Cusp Shapes**

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.167676 + 1.064370I$<br>$a = 0.778944 + 0.169238I$<br>$b = -0.470107 + 0.435995I$ | $3.40475 - 2.26424I$ | $9.47951 + 3.87164I$ |
| $u = -0.167676 - 1.064370I$<br>$a = 0.778944 - 0.169238I$<br>$b = -0.470107 - 0.435995I$ | $3.40475 + 2.26424I$ | $9.47951 - 3.87164I$ |
| $u = -0.617073 + 0.561498I$<br>$a = -1.89242 + 0.26973I$<br>$b = -0.37899 + 2.12914I$ | $-2.80940 + 6.68744I$ | $4.35067 - 3.31669I$ |
| $u = -0.617073 - 0.561498I$<br>$a = -1.89242 - 0.26973I$<br>$b = -0.37899 - 2.12914I$ | $-2.80940 - 6.68744I$ | $4.35067 + 3.31669I$ |
| $u = -0.715606 + 0.424836I$<br>$a = 1.350570 - 0.398846I$<br>$b = 0.62117 - 2.62903I$ | $-2.31988 - 11.15510I$ | $5.36635 + 8.72298I$ |
| $u = -0.715606 - 0.424836I$<br>$a = 1.350570 + 0.398846I$<br>$b = 0.62117 + 2.62903I$ | $-2.31988 + 11.15510I$ | $5.36635 - 8.72298I$ |
| $u = 0.677267 + 0.437562I$<br>$a = -1.279370 - 0.460443I$<br>$b = -0.40698 - 2.65012I$ | $-6.72347 + 6.63996I$ | $1.11534 - 6.53780I$ |
| $u = 0.677267 - 0.437562I$<br>$a = -1.279370 + 0.460443I$<br>$b = -0.40698 + 2.65012I$ | $-6.72347 - 6.63996I$ | $1.11534 + 6.53780I$ |
| $u = 0.252222 + 0.762976I$<br>$a = 0.970740 - 0.162669I$<br>$b = -0.393396 + 1.056380I$ | $3.14407 - 2.16679I$ | $8.11057 + 2.63992I$ |
| $u = 0.252222 - 0.762976I$<br>$a = 0.970740 + 0.162669I$<br>$b = -0.393396 - 1.056380I$ | $3.14407 + 2.16679I$ | $8.11057 - 2.63992I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.619485 + 0.505792I$<br>$a = 2.02337 + 0.19994I$<br>$b = 0.63493 + 2.03020I$ | $-6.98732 - 2.33424I$ | $0.197314 + 0.287759I$ |
| $u = 0.619485 - 0.505792I$<br>$a = 2.02337 - 0.19994I$<br>$b = 0.63493 - 2.03020I$ | $-6.98732 + 2.33424I$ | $0.197314 - 0.287759I$ |
| $u = 0.678594 + 0.396938I$<br>$a = -0.306907 - 0.562427I$<br>$b = 0.588764 - 0.054642I$ | $0.90488 + 6.19501I$ | $8.65458 - 5.85948I$ |
| $u = 0.678594 - 0.396938I$<br>$a = -0.306907 + 0.562427I$<br>$b = 0.588764 + 0.054642I$ | $0.90488 - 6.19501I$ | $8.65458 + 5.85948I$ |
| $u = 0.555271 + 0.515337I$<br>$a = -0.193065 - 0.411686I$<br>$b = 0.636055 + 0.278393I$ | $0.40390 - 2.07527I$ | $7.58708 - 0.16558I$ |
| $u = 0.555271 - 0.515337I$<br>$a = -0.193065 + 0.411686I$<br>$b = 0.636055 - 0.278393I$ | $0.40390 + 2.07527I$ | $7.58708 + 0.16558I$ |
| $u = 0.004497 + 1.254000I$<br>$a = -1.19737 - 0.79732I$<br>$b = 1.006470 + 0.945825I$ | $-2.64701 + 1.46809I$ | $0$ |
| $u = 0.004497 - 1.254000I$<br>$a = -1.19737 + 0.79732I$<br>$b = 1.006470 - 0.945825I$ | $-2.64701 - 1.46809I$ | $0$ |
| $u = 0.693958 + 0.185476I$<br>$a = -1.059550 + 0.036670I$<br>$b = -0.487962 - 1.323070I$ | $5.18309 + 5.73272I$ | $11.27016 - 7.28979I$ |
| $u = 0.693958 - 0.185476I$<br>$a = -1.059550 - 0.036670I$<br>$b = -0.487962 + 1.323070I$ | $5.18309 - 5.73272I$ | $11.27016 + 7.28979I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.233838+1.278280I$<br>$a=-0.114835-0.343745I$<br>$b=\ \ 0.465963+0.494287I$ | $2.08059-4.29919I$ | $0$ |
| $u=-0.233838-1.278280I$<br>$a=-0.114835+0.343745I$<br>$b=\ \ 0.465963-0.494287I$ | $2.08059+4.29919I$ | $0$ |
| $u=-0.670778+0.090636I$<br>$a=\ \ 0.695159-0.378048I$<br>$b=\ \ 0.035918+0.211766I$ | $6.30803-1.01693I$ | $14.2364+0.8419I$ |
| $u=-0.670778-0.090636I$<br>$a=\ \ 0.695159+0.378048I$<br>$b=\ \ 0.035918-0.211766I$ | $6.30803+1.01693I$ | $14.2364-0.8419I$ |
| $u=-0.196767+1.339410I$<br>$a=\ \ 1.98113+1.52913I$<br>$b=-0.93410-1.43004I$ | $-4.92180-6.08417I$ | $0$ |
| $u=-0.196767-1.339410I$<br>$a=\ \ 1.98113-1.52913I$<br>$b=-0.93410+1.43004I$ | $-4.92180+6.08417I$ | $0$ |
| $u=\ \ 0.265708+1.335960I$<br>$a=-1.24758+1.71469I$<br>$b=-0.054082-1.297110I$ | $0.40943+9.20745I$ | $0$ |
| $u=\ \ 0.265708-1.335960I$<br>$a=-1.24758-1.71469I$<br>$b=-0.054082+1.297110I$ | $0.40943-9.20745I$ | $0$ |
| $u=-0.565566+0.178039I$<br>$a=\ \ 0.847644-0.080313I$<br>$b=-0.168017-1.386940I$ | $-0.16483-3.30304I$ | $6.58993+8.73893I$ |
| $u=-0.565566-0.178039I$<br>$a=\ \ 0.847644+0.080313I$<br>$b=-0.168017+1.386940I$ | $-0.16483+3.30304I$ | $6.58993-8.73893I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.075529 + 1.409520I$<br>$a = -0.06668 - 2.20376I$<br>$b = -0.56477 + 1.41957I$ | $-7.18390 - 0.26810I$ | 0 |
| $u = -0.075529 - 1.409520I$<br>$a = -0.06668 + 2.20376I$<br>$b = -0.56477 - 1.41957I$ | $-7.18390 + 0.26810I$ | 0 |
| $u = 0.25245 + 1.46110I$<br>$a = -0.594045 - 0.560678I$<br>$b = 0.440686 + 0.137021I$ | $-5.08167 + 9.59602I$ | 0 |
| $u = 0.25245 - 1.46110I$<br>$a = -0.594045 + 0.560678I$<br>$b = 0.440686 - 0.137021I$ | $-5.08167 - 9.59602I$ | 0 |
| $u = 0.19236 + 1.47058I$<br>$a = -0.541758 - 0.828898I$<br>$b = 0.550975 + 0.570094I$ | $-5.96591 + 0.62329I$ | 0 |
| $u = 0.19236 - 1.47058I$<br>$a = -0.541758 + 0.828898I$<br>$b = 0.550975 - 0.570094I$ | $-5.96591 - 0.62329I$ | 0 |
| $u = 0.04361 + 1.49144I$<br>$a = 0.26431 - 2.05562I$<br>$b = 0.16481 + 1.98787I$ | $-3.91948 - 1.38659I$ | 0 |
| $u = 0.04361 - 1.49144I$<br>$a = 0.26431 + 2.05562I$<br>$b = 0.16481 - 1.98787I$ | $-3.91948 + 1.38659I$ | 0 |
| $u = 0.24647 + 1.47591I$<br>$a = -1.23308 + 3.23255I$<br>$b = -0.78225 - 3.64550I$ | $-12.9040 + 10.0134I$ | 0 |
| $u = 0.24647 - 1.47591I$<br>$a = -1.23308 - 3.23255I$<br>$b = -0.78225 + 3.64550I$ | $-12.9040 - 10.0134I$ | 0 |

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.26382 + 1.47698I$<br>$a = 1.05482 + 3.15508I$<br>$b = 1.08638 - 3.45807I$ | $-8.4594 - 14.7285I$ | 0 |
| $u = -0.26382 - 1.47698I$<br>$a = 1.05482 - 3.15508I$<br>$b = 1.08638 + 3.45807I$ | $-8.4594 + 14.7285I$ | 0 |
| $u = 0.21115 + 1.48782I$<br>$a = 0.15274 - 2.56686I$<br>$b = 1.82838 + 2.31454I$ | $-13.44400 + 0.67957I$ | 0 |
| $u = 0.21115 - 1.48782I$<br>$a = 0.15274 + 2.56686I$<br>$b = 1.82838 - 2.31454I$ | $-13.44400 - 0.67957I$ | 0 |
| $u = -0.19310 + 1.50554I$<br>$a = -0.22564 - 2.54437I$<br>$b = -1.59683 + 2.50677I$ | $-9.54977 + 3.78347I$ | 0 |
| $u = -0.19310 - 1.50554I$<br>$a = -0.22564 + 2.54437I$<br>$b = -1.59683 - 2.50677I$ | $-9.54977 - 3.78347I$ | 0 |
| $u = -0.202679 + 0.413695I$<br>$a = -1.41900 - 1.17309I$<br>$b = -0.167114 + 0.794243I$ | $-1.52088 + 0.82300I$ | $-1.75933 - 1.01274I$ |
| $u = -0.202679 - 0.413695I$<br>$a = -1.41900 + 1.17309I$<br>$b = -0.167114 - 0.794243I$ | $-1.52088 - 0.82300I$ | $-1.75933 + 1.01274I$ |
| $u = 0.418775$<br>$a = -0.496253$<br>$b = 0.688205$ | 0.773938 | 13.3940 |

**II.** $I_2^u =$
$\langle -15a^2u^2+29u^2a+\cdots+86a+46,\ a^3-4u^2a-2a^2-5au-u^2+5u-3,\ u^3+2u-1\rangle$

**(i) Arc colorings**

$$a_4 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} a \\ 0.681818a^2u^2 - 1.31818au^2 + \cdots - 3.90909a - 2.09091 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} u \\ -u+1 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} -0.409091a^2u^2 + 0.590909au^2 + \cdots + 1.54545a + 0.454545 \\ \frac{1}{2}a^2u^2 - \frac{3}{2}u^2a + \cdots - 4a - 1 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} u^2+1 \\ u \end{pmatrix}$$

$$a_3 = \begin{pmatrix} -u^2-u \\ u^2 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 0.0454545a^2u^2 + 0.0454545au^2 + \cdots - 0.727273a - 0.272727 \\ 0.818182a^2u^2 - 1.68182au^2 + \cdots - 3.59091a - 1.90909 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} u^2-u+1 \\ u \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} u^2+u \\ -u^2 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -0.227273a^2u^2 + 0.272727au^2 + \cdots + 0.136364a + 0.363636 \\ 0.545455a^2u^2 - 1.45455au^2 + \cdots - 3.72727a - 1.27273 \end{pmatrix}$$

**(ii) Obstruction class** $= -1$

**(iii) Cusp Shapes** $= 4u^2 + 4u + 10$

**(iv) u-Polynomials at the component**

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^9 + 6u^8 + 15u^7 + 16u^6 - u^5 - 18u^4 - 11u^3 + 4u^2 + 4u + 1$ |
| $c_2, c_5, c_6$<br>$c_7, c_{12}$ | $u^9 - 3u^7 + 3u^5 + u^3 - 2u + 1$ |
| $c_3$ | $(u^3 - 3u^2 + 5u - 2)^3$ |
| $c_4, c_8, c_9$<br>$c_{10}, c_{11}$ | $(u^3 + 2u - 1)^3$ |

**(v) Riley Polynomials at the component**

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^9 - 6y^8 + 31y^7 - 92y^6 + 207y^5 - 322y^4 + 225y^3 - 68y^2 + 8y - 1$ |
| $c_2, c_5, c_6$ $c_7, c_{12}$ | $y^9 - 6y^8 + 15y^7 - 16y^6 - y^5 + 18y^4 - 11y^3 - 4y^2 + 4y - 1$ |
| $c_3$ | $(y^3 + y^2 + 13y - 4)^3$ |
| $c_4, c_8, c_9$ $c_{10}, c_{11}$ | $(y^3 + 4y^2 + 4y - 1)^3$ |

**(vi) Complex Volumes and Cusp Shapes**

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.22670 + 1.46771I$<br>$a = 0.583843 - 0.678582I$<br>$b = -0.519013 + 0.319210I$ | $-9.44074 - 5.13794I$ | $0.68207 + 3.20902I$ |
| $u = -0.22670 + 1.46771I$<br>$a = -0.07989 - 2.57481I$<br>$b = -2.01693 + 2.08171I$ | $-9.44074 - 5.13794I$ | $0.68207 + 3.20902I$ |
| $u = -0.22670 + 1.46771I$<br>$a = 1.49604 + 3.25339I$<br>$b = 0.33038 - 3.73184I$ | $-9.44074 - 5.13794I$ | $0.68207 + 3.20902I$ |
| $u = -0.22670 - 1.46771I$<br>$a = 0.583843 + 0.678582I$<br>$b = -0.519013 - 0.319210I$ | $-9.44074 + 5.13794I$ | $0.68207 - 3.20902I$ |
| $u = -0.22670 - 1.46771I$<br>$a = -0.07989 + 2.57481I$<br>$b = -2.01693 - 2.08171I$ | $-9.44074 + 5.13794I$ | $0.68207 - 3.20902I$ |
| $u = -0.22670 - 1.46771I$<br>$a = 1.49604 - 3.25339I$<br>$b = 0.33038 + 3.73184I$ | $-9.44074 + 5.13794I$ | $0.68207 - 3.20902I$ |
| $u = 0.453398$<br>$a = -0.547908 + 0.054538I$<br>$b = 0.637390 - 0.369377I$ | 0.787199 | 12.6360 |
| $u = 0.453398$<br>$a = -0.547908 - 0.054538I$<br>$b = 0.637390 + 0.369377I$ | 0.787199 | 12.6360 |
| $u = 0.453398$<br>$a = 3.09582$<br>$b = 1.13636$ | 0.787199 | 12.6360 |

**III. $I^u_3 = \langle 11u^3a^2 + 23u^3a + \cdots - a - 22,\ a^3 + 2a^2u + u^2a + 2a^2 + 5au + 2u^2 - u - 1,\ u^4 + u^3 + 2u^2 + 2u + 1\rangle$**

**(i) Arc colorings**

$$a_4 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} a \\ -0.578947a^2u^3 - 1.21053au^3 + \cdots + 0.0526316a + 1.15789 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} u \\ u^3 + u \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 0.315789a^2u^3 + 0.842105au^3 + \cdots + 1.78947a - 0.631579 \\ -0.947368a^2u^3 - 0.526316au^3 + \cdots + 0.631579a + 1.89474 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} u^2 + 1 \\ -u^3 - 2u - 1 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} -u^3 - 2u - 1 \\ -u^3 - u^2 - u - 2 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 0.789474a^2u^3 + 0.105263au^3 + \cdots - 0.526316a - 1.57895 \\ 0.789474a^2u^3 + 1.10526au^3 + \cdots + 2.47368a - 1.57895 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} u^3 + u^2 + 2u + 2 \\ -u^3 - 2u - 1 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} u^3 + 2u + 1 \\ u^3 + u^2 + u + 2 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 0.263158a^2u^3 + 1.36842au^3 + \cdots + 1.15789a - 0.526316 \\ -0.105263a^2u^3 + 1.05263au^3 + \cdots + 2.73684a + 0.210526 \end{pmatrix}$$

**(ii) Obstruction class** $= -1$

**(iii) Cusp Shapes** $= 4u^3 + 4u + 6$

**(iv) u-Polynomials at the component**

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{12}+8u^{11}+\cdots+2u^2+1$ |
| $c_2, c_5, c_6$<br>$c_7, c_{12}$ | $u^{12}-4u^{10}-u^9+6u^8+3u^7-2u^6-3u^5-3u^4-u^3+2u^2+2u+1$ |
| $c_3$ | $(u^2+u+1)^6$ |
| $c_4, c_8, c_9$<br>$c_{10}, c_{11}$ | $(u^4+u^3+2u^2+2u+1)^3$ |

**(v) Riley Polynomials at the component**

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{12} - 8y^{11} + \cdots + 4y + 1$ |
| $c_2, c_5, c_6$ $c_7, c_{12}$ | $y^{12} - 8y^{11} + \cdots + 2y^2 + 1$ |
| $c_3$ | $(y^2 + y + 1)^6$ |
| $c_4, c_8, c_9$ $c_{10}, c_{11}$ | $(y^4 + 3y^3 + 2y^2 + 1)^3$ |

**(vi) Complex Volumes and Cusp Shapes**

| Solutions to $I_3^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.621744 + 0.440597I$<br>$a = 1.164420 - 0.511133I$<br>$b = 0.14782 - 2.60434I$ | $-3.28987 - 2.02988I$ | $4.00000 + 3.46410I$ |
| $u = -0.621744 + 0.440597I$<br>$a = 0.253508 - 0.493412I$<br>$b = -0.619418 + 0.097186I$ | $-3.28987 - 2.02988I$ | $4.00000 + 3.46410I$ |
| $u = -0.621744 + 0.440597I$<br>$a = -2.17444 + 0.12335I$<br>$b = -0.91328 + 1.87086I$ | $-3.28987 - 2.02988I$ | $4.00000 + 3.46410I$ |
| $u = -0.621744 - 0.440597I$<br>$a = 1.164420 + 0.511133I$<br>$b = 0.14782 + 2.60434I$ | $-3.28987 + 2.02988I$ | $4.00000 - 3.46410I$ |
| $u = -0.621744 - 0.440597I$<br>$a = 0.253508 + 0.493412I$<br>$b = -0.619418 - 0.097186I$ | $-3.28987 + 2.02988I$ | $4.00000 - 3.46410I$ |
| $u = -0.621744 - 0.440597I$<br>$a = -2.17444 - 0.12335I$<br>$b = -0.91328 - 1.87086I$ | $-3.28987 + 2.02988I$ | $4.00000 - 3.46410I$ |
| $u = 0.121744 + 1.306620I$<br>$a = 0.276849 - 0.783184I$<br>$b = -0.361992 + 0.876949I$ | $-3.28987 + 2.02988I$ | $4.00000 - 3.46410I$ |
| $u = 0.121744 + 1.306620I$<br>$a = -0.07790 - 2.21669I$<br>$b = 0.939408 + 0.575735I$ | $-3.28987 + 2.02988I$ | $4.00000 - 3.46410I$ |
| $u = 0.121744 + 1.306620I$<br>$a = -2.44244 + 0.38663I$<br>$b = 1.80746 - 0.35693I$ | $-3.28987 + 2.02988I$ | $4.00000 - 3.46410I$ |
| $u = 0.121744 - 1.306620I$<br>$a = 0.276849 + 0.783184I$<br>$b = -0.361992 - 0.876949I$ | $-3.28987 - 2.02988I$ | $4.00000 + 3.46410I$ |

| Solutions to $I_3^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = \quad 0.121744 - 1.306620I$<br>$a = -0.07790 + 2.21669I$<br>$b = \quad 0.939408 - 0.575735I$ | $-3.28987 - 2.02988I$ | $4.00000 + 3.46410I$ |
| $u = \quad 0.121744 - 1.306620I$<br>$a = -2.44244 - 0.38663I$<br>$b = \quad 1.80746 + 0.35693I$ | $-3.28987 - 2.02988I$ | $4.00000 + 3.46410I$ |

**IV. $I_4^u = \langle b - u + 1,\ 2a + 3u - 2,\ u^2 + 2\rangle$**

**(i) Arc colorings**

$$a_4 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} -\frac{3}{2}u + 1 \\ u - 1 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} u \\ -u \end{pmatrix}$$

$$a_6 = \begin{pmatrix} -\frac{1}{2}u + 1 \\ -1 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} -u \\ u \end{pmatrix}$$

$$a_1 = \begin{pmatrix} -\frac{1}{2}u + 1 \\ -1 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -\frac{1}{2}u \\ -1 \end{pmatrix}$$

**(ii) Obstruction class** $= 1$

**(iii) Cusp Shapes** $= 0$

**(iv) u-Polynomials at the component**

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_5, c_6$<br>$c_7$ | $(u-1)^2$ |
| $c_2, c_{12}$ | $(u+1)^2$ |
| $c_3, c_4, c_9$<br>$c_{10}$ | $u^2+2$ |
| $c_8, c_{11}$ | $u^2$ |

**(v) Riley Polynomials at the component**

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_2, c_5$<br>$c_6, c_7, c_{12}$ | $(y-1)^2$ |
| $c_3, c_4, c_9$<br>$c_{10}$ | $(y+2)^2$ |
| $c_8, c_{11}$ | $y^2$ |

**(vi) Complex Volumes and Cusp Shapes**

| Solutions to $I_4^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.414210I$<br>$a = 1.00000 - 2.12132I$<br>$b = -1.00000 + 1.41421I$ | $-4.93480$ | 0 |
| $u = -1.414210I$<br>$a = 1.00000 + 2.12132I$<br>$b = -1.00000 - 1.41421I$ | $-4.93480$ | 0 |

## V. $I_1^v = \langle a,\ b+1,\ v-1 \rangle$

**(i) Arc colorings**

$$a_4 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} -1 \\ -1 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$$

**(ii) Obstruction class** $= 1$

**(iii) Cusp Shapes** $= 0$

**(iv) u-Polynomials at the component**

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_2, c_{12}$ | $u - 1$ |
| $c_3, c_4, c_8$<br>$c_9, c_{10}, c_{11}$ | $u$ |
| $c_5, c_6, c_7$ | $u + 1$ |

**(v) Riley Polynomials at the component**

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_2, c_5$<br>$c_6, c_7, c_{12}$ | $y - 1$ |
| $c_3, c_4, c_8$<br>$c_9, c_{10}, c_{11}$ | $y$ |

**(vi) Complex Volumes and Cusp Shapes**

| Solutions to $I_1^v$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $v = 1.00000$ | | |
| $a = 0$ | 0 | 0 |
| $b = -1.00000$ | | |

## VI. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $((u-1)^3)(u^9+6u^8+\cdots+4u+1)$ $\cdot(u^{12}+8u^{11}+\cdots+2u^2+1)(u^{49}+26u^{48}+\cdots+85u+9)$ |
| $c_2$ | $(u-1)(u+1)^2(u^9-3u^7+3u^5+u^3-2u+1)$ $\cdot(u^{12}-4u^{10}-u^9+6u^8+3u^7-2u^6-3u^5-3u^4-u^3+2u^2+2u+1)$ $\cdot(u^{49}+2u^{48}+\cdots-5u-3)$ |
| $c_3$ | $u(u^2+2)(u^2+u+1)^6(u^3-3u^2+5u-2)^3$ $\cdot(u^{49}+2u^{48}+\cdots+796u-202)$ |
| $c_4, c_9, c_{10}$ | $u(u^2+2)(u^3+2u-1)^3(u^4+u^3+2u^2+2u+1)^3$ $\cdot(u^{49}-2u^{48}+\cdots+4u-2)$ |
| $c_5$ | $(u-1)^2(u+1)(u^9-3u^7+3u^5+u^3-2u+1)$ $\cdot(u^{12}-4u^{10}-u^9+6u^8+3u^7-2u^6-3u^5-3u^4-u^3+2u^2+2u+1)$ $\cdot(u^{49}+2u^{48}+\cdots-5u-3)$ |
| $c_6, c_7$ | $(u-1)^2(u+1)(u^9-3u^7+3u^5+u^3-2u+1)$ $\cdot(u^{12}-4u^{10}-u^9+6u^8+3u^7-2u^6-3u^5-3u^4-u^3+2u^2+2u+1)$ $\cdot(u^{49}-2u^{48}+\cdots-9u-3)$ |
| $c_8, c_{11}$ | $u^3(u^3+2u-1)^3(u^4+u^3+2u^2+2u+1)^3$ $\cdot(u^{49}+6u^{48}+\cdots-672u-144)$ |
| $c_{12}$ | $(u-1)(u+1)^2(u^9-3u^7+3u^5+u^3-2u+1)$ $\cdot(u^{12}-4u^{10}-u^9+6u^8+3u^7-2u^6-3u^5-3u^4-u^3+2u^2+2u+1)$ $\cdot(u^{49}-2u^{48}+\cdots-9u-3)$ |

## VII. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $(y-1)^3$ <br> $\cdot (y^9 - 6y^8 + 31y^7 - 92y^6 + 207y^5 - 322y^4 + 225y^3 - 68y^2 + 8y - 1)$ <br> $\cdot (y^{12} - 8y^{11} + \cdots + 4y + 1)(y^{49} - 2y^{48} + \cdots + 1321y - 81)$ |
| $c_2, c_5$ | $((y-1)^3)(y^9 - 6y^8 + \cdots + 4y - 1)$ <br> $\cdot (y^{12} - 8y^{11} + \cdots + 2y^2 + 1)(y^{49} - 26y^{48} + \cdots + 85y - 9)$ |
| $c_3$ | $y(y+2)^2(y^2+y+1)^6(y^3+y^2+13y-4)^3$ <br> $\cdot (y^{49} + 22y^{48} + \cdots - 274576y - 40804)$ |
| $c_4, c_9, c_{10}$ | $y(y+2)^2(y^3+4y^2+4y-1)^3(y^4+3y^3+2y^2+1)^3$ <br> $\cdot (y^{49} + 46y^{48} + \cdots + 8y - 4)$ |
| $c_6, c_7, c_{12}$ | $((y-1)^3)(y^9 - 6y^8 + \cdots + 4y - 1)$ <br> $\cdot (y^{12} - 8y^{11} + \cdots + 2y^2 + 1)(y^{49} - 42y^{48} + \cdots - 123y - 9)$ |
| $c_8, c_{11}$ | $y^3(y^3+4y^2+4y-1)^3(y^4+3y^3+2y^2+1)^3$ <br> $\cdot (y^{49} + 42y^{48} + \cdots - 46080y - 20736)$ |