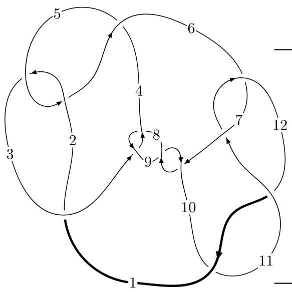
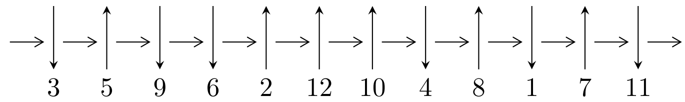
# $12a_{0181}$ $(K12a_{0181})$




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$I_1^u = \langle u^{19} + 3u^{18} + \cdots + 4b + 2u,\ -u^{18} - 3u^{17} + \cdots + 4a - 6,\ u^{20} + 5u^{19} + \cdots + 12u + 4\rangle$$
$$I_2^u = \langle -82u^{32}a + 53u^{32} + \cdots + 116a + 32,\ 2u^{32}a + u^{32} + \cdots + 12a - 17,\ u^{33} - 2u^{32} + \cdots - u + 2\rangle$$

$$I_1^v = \langle a,\ b^2 + b + 1,\ v + 1\rangle$$
$$I_2^v = \langle a,\ b - v + 1,\ v^2 - v + 1\rangle$$

* 4 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 90 representations.

[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. $I_1^u = \langle u^{19}+3u^{18}+\cdots+4b+2u,\ -u^{18}-3u^{17}+\cdots+4a-6,\ u^{20}+5u^{19}+\cdots+12u+4\rangle$

**(i) Arc colorings**

$$a_3 = \begin{pmatrix}1\\0\end{pmatrix}$$
$$a_9 = \begin{pmatrix}0\\u\end{pmatrix}$$
$$a_4 = \begin{pmatrix}1\\u^2\end{pmatrix}$$
$$a_5 = \begin{pmatrix}\frac{1}{4}u^{18}+\frac{3}{4}u^{17}+\cdots+u+\frac{3}{2}\\-\frac{1}{4}u^{19}-\frac{3}{4}u^{18}+\cdots-\frac{9}{4}u^3-\frac{1}{2}u\end{pmatrix}$$
$$a_2 = \begin{pmatrix}-\frac{7}{4}u^{19}-8u^{18}+\cdots-15u-\frac{9}{2}\\-\frac{3}{4}u^{19}-\frac{15}{4}u^{18}+\cdots-\frac{19}{2}u-4\end{pmatrix}$$
$$a_6 = \begin{pmatrix}-\frac{7}{4}u^{19}-8u^{18}+\cdots-15u-\frac{9}{2}\\\frac{9}{4}u^{19}+\frac{31}{4}u^{18}+\cdots+\frac{15}{2}u+1\end{pmatrix}$$
$$a_1 = \begin{pmatrix}-\frac{5}{2}u^{19}-\frac{47}{4}u^{18}+\cdots-\frac{49}{2}u-\frac{17}{2}\\-\frac{3}{4}u^{19}-\frac{15}{4}u^{18}+\cdots-\frac{19}{2}u-4\end{pmatrix}$$
$$a_8 = \begin{pmatrix}u\\u^3+u\end{pmatrix}$$
$$a_{10} = \begin{pmatrix}u^3\\u^5+u^3+u\end{pmatrix}$$
$$a_{11} = \begin{pmatrix}-\frac{1}{4}u^{19}-u^{18}+\cdots-\frac{3}{2}u-\frac{1}{2}\\-\frac{1}{4}u^{19}-\frac{5}{4}u^{18}+\cdots-\frac{3}{2}u-1\end{pmatrix}$$
$$a_7 = \begin{pmatrix}u^5+u\\u^7+u^5+2u^3+u\end{pmatrix}$$
$$a_{12} = \begin{pmatrix}-\frac{7}{4}u^{19}-7u^{18}+\cdots-\frac{21}{2}u-\frac{7}{2}\\-\frac{7}{4}u^{19}-\frac{37}{4}u^{18}+\cdots-\frac{37}{2}u-8\end{pmatrix}$$

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

**(iii) Cusp Shapes**
$= -13u^{19}-66u^{18}-180u^{17}-337u^{16}-477u^{15}-527u^{14}-374u^{13}-30u^{12}+397u^{11}+641u^{10}+698u^9+494u^8+210u^7-106u^6-168u^5-196u^4-209u^3-259u^2-158u-62$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_4, c_{10}$ $c_{12}$ | $u^{20} + 7u^{19} + \cdots + 6u + 1$ |
| $c_2, c_5, c_6$ $c_{11}$ | $u^{20} + u^{19} + \cdots - 2u + 1$ |
| $c_3, c_8$ | $u^{20} + 5u^{19} + \cdots + 12u + 4$ |
| $c_7, c_9$ | $u^{20} - 5u^{19} + \cdots - 48u + 16$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4, c_{10}$ $c_{12}$ | $y^{20} + 15y^{19} + \cdots + 42y + 1$ |
| $c_2, c_5, c_6$ $c_{11}$ | $y^{20} + 7y^{19} + \cdots + 6y + 1$ |
| $c_3, c_8$ | $y^{20} + 5y^{19} + \cdots + 48y + 16$ |
| $c_7, c_9$ | $y^{20} + 13y^{19} + \cdots + 2560y + 256$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.956413 + 0.106188I$<br>$a = 0.666389 - 0.362681I$<br>$b = -0.690206 - 0.870989I$ | $3.29641 + 5.31416I$ | $3.14759 - 6.32881I$ |
| $u = 0.956413 - 0.106188I$<br>$a = 0.666389 + 0.362681I$<br>$b = -0.690206 + 0.870989I$ | $3.29641 - 5.31416I$ | $3.14759 + 6.32881I$ |
| $u = -0.859253 + 0.598044I$<br>$a = 0.726799 - 0.250535I$<br>$b = -0.710902 - 0.608435I$ | $0.831191 + 0.623147I$ | $2.59573 - 2.24523I$ |
| $u = -0.859253 - 0.598044I$<br>$a = 0.726799 + 0.250535I$<br>$b = -0.710902 + 0.608435I$ | $0.831191 - 0.623147I$ | $2.59573 + 2.24523I$ |
| $u = 0.511571 + 0.639622I$<br>$a = 1.075070 + 0.676318I$<br>$b = -0.102085 + 0.859228I$ | $-2.97361 - 1.87280I$ | $-8.34696 + 4.79097I$ |
| $u = 0.511571 - 0.639622I$<br>$a = 1.075070 - 0.676318I$<br>$b = -0.102085 - 0.859228I$ | $-2.97361 + 1.87280I$ | $-8.34696 - 4.79097I$ |
| $u = 0.193921 + 1.176600I$<br>$a = -1.33172 - 1.10006I$<br>$b = 0.775256 + 0.795478I$ | $8.04637 + 1.61009I$ | $7.70402 - 2.24180I$ |
| $u = 0.193921 - 1.176600I$<br>$a = -1.33172 + 1.10006I$<br>$b = 0.775256 - 0.795478I$ | $8.04637 - 1.61009I$ | $7.70402 + 2.24180I$ |
| $u = -0.962446 + 0.718212I$<br>$a = 0.613669 + 0.425585I$<br>$b = -0.666520 + 1.031640I$ | $-1.66717 - 10.06630I$ | $-1.36976 + 7.52063I$ |
| $u = -0.962446 - 0.718212I$<br>$a = 0.613669 - 0.425585I$<br>$b = -0.666520 - 1.031640I$ | $-1.66717 + 10.06630I$ | $-1.36976 - 7.52063I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.824880+0.894608I$<br>$a=\ \ 0.753015-1.021300I$<br>$b=-0.023434-1.120850I$ | $-9.84057+3.07245I$ | $-9.39268-2.83211I$ |
| $u=-0.824880-0.894608I$<br>$a=\ \ 0.753015+1.021300I$<br>$b=-0.023434+1.120850I$ | $-9.84057-3.07245I$ | $-9.39268+2.83211I$ |
| $u=\ \ 0.337755+1.176280I$<br>$a=-2.12989+0.17473I$<br>$b=\ \ 0.738480-0.944822I$ | $7.12649-9.83704I$ | $5.40465+9.06026I$ |
| $u=\ \ 0.337755-1.176280I$<br>$a=-2.12989-0.17473I$<br>$b=\ \ 0.738480+0.944822I$ | $7.12649+9.83704I$ | $5.40465-9.06026I$ |
| $u=-0.716852+1.049790I$<br>$a=-0.357717+0.974184I$<br>$b=\ \ 0.809192-0.602967I$ | $2.16361+5.20834I$ | $3.98742-2.19274I$ |
| $u=-0.716852-1.049790I$<br>$a=-0.357717-0.974184I$<br>$b=\ \ 0.809192+0.602967I$ | $2.16361-5.20834I$ | $3.98742+2.19274I$ |
| $u=-0.342141+0.579550I$<br>$a=\ \ 0.950288-0.152216I$<br>$b=-0.318780-0.354384I$ | $0.155657+1.086730I$ | $2.50050-5.83378I$ |
| $u=-0.342141-0.579550I$<br>$a=\ \ 0.950288+0.152216I$<br>$b=-0.318780+0.354384I$ | $0.155657-1.086730I$ | $2.50050+5.83378I$ |
| $u=-0.794089+1.065150I$<br>$a=-1.96591+0.82985I$<br>$b=\ \ 0.688998+1.054600I$ | $-0.5586+16.5027I$ | $-0.23050-11.16239I$ |
| $u=-0.794089-1.065150I$<br>$a=-1.96591-0.82985I$<br>$b=\ \ 0.688998-1.054600I$ | $-0.5586-16.5027I$ | $-0.23050+11.16239I$ |

## II. $I_2^u = \langle -82u^{32}a + 53u^{32} + \cdots + 116a + 32,\ 2u^{32}a + u^{32} + \cdots + 12a - 17,\ u^{33} - 2u^{32} + \cdots - u + 2 \rangle$

**(i) Arc colorings**

$$a_3 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

$$a_4 = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} a \\ 1.20588au^{32} - 0.779412u^{32} + \cdots - 1.70588a - 0.470588 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} 1.27941au^{32} - 0.147059u^{32} + \cdots + 0.470588a - 1.60294 \\ 0.514706au^{32} + 0.426471u^{32} + \cdots - 1.26471a - 0.176471 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 1.27941au^{32} - 0.147059u^{32} + \cdots + 0.470588a - 1.60294 \\ -0.647059au^{32} - 1.26471u^{32} + \cdots - 1.35294a + 2.26471 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 1.79412au^{32} + 0.279412u^{32} + \cdots - 0.794118a - 1.77941 \\ 0.514706au^{32} + 0.426471u^{32} + \cdots - 1.26471a - 0.176471 \end{pmatrix}$$

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

$$a_{10} = \begin{pmatrix} u^3 \\ u^5 + u^3 + u \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} -0.911765au^{32} + 1.05882u^{32} + \cdots + 2.91176a - 1.30882 \\ -u^{32} + 2u^{31} + \cdots - \frac{1}{2}u + 2 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} u^5 + u \\ u^7 + u^5 + 2u^3 + u \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} -0.911765au^{32} + 1.55882u^{32} + \cdots + 2.91176a - 0.308824 \\ 1.35294au^{32} - 1.01471u^{32} + \cdots - 1.35294a + 1.26471 \end{pmatrix}$$

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

**(iii) Cusp Shapes**

$= -u^{32} - 2u^{31} - 3u^{30} - 8u^{29} - 11u^{28} - 28u^{27} - 26u^{26} - 60u^{25} - 55u^{24} - 114u^{23} - 106u^{22} - 160u^{21} - 162u^{20} - 198u^{19} - 234u^{18} - 196u^{17} - 257u^{16} - 162u^{15} - 244u^{14} - 124u^{13} - 166u^{12} - 72u^{11} - 64u^{10} - 54u^9 + 4u^8 - 28u^7 + 34u^6 - 16u^5 + 22u^4 - 6u^3 + 4u^2 - 2u + 1$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_4, c_{10}$ $c_{12}$ | $u^{66} + 24u^{65} + \cdots + 17u + 1$ |
| $c_2, c_5, c_6$ $c_{11}$ | $u^{66} + 2u^{65} + \cdots + u + 1$ |
| $c_3, c_8$ | $(u^{33} - 2u^{32} + \cdots - u + 2)^2$ |
| $c_7, c_9$ | $(u^{33} - 10u^{32} + \cdots - 23u + 4)^2$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4, c_{10}$ <br> $c_{12}$ | $y^{66} + 36y^{65} + \cdots + 97y + 1$ |
| $c_2, c_5, c_6$ <br> $c_{11}$ | $y^{66} + 24y^{65} + \cdots + 17y + 1$ |
| $c_3, c_8$ | $(y^{33} + 10y^{32} + \cdots - 23y - 4)^2$ |
| $c_7, c_9$ | $(y^{33} + 26y^{32} + \cdots - 335y - 16)^2$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.049702 + 0.985538I$<br>$a = 0.804899 - 0.013377I$<br>$b = -0.628084 - 0.033140I$ | $4.01597 + 2.68651I$ | $7.73425 - 3.44417I$ |
| $u = -0.049702 + 0.985538I$<br>$a = -2.27679 - 1.25073I$<br>$b = 0.701064 + 0.855945I$ | $4.01597 + 2.68651I$ | $7.73425 - 3.44417I$ |
| $u = -0.049702 - 0.985538I$<br>$a = 0.804899 + 0.013377I$<br>$b = -0.628084 + 0.033140I$ | $4.01597 - 2.68651I$ | $7.73425 + 3.44417I$ |
| $u = -0.049702 - 0.985538I$<br>$a = -2.27679 + 1.25073I$<br>$b = 0.701064 - 0.855945I$ | $4.01597 - 2.68651I$ | $7.73425 + 3.44417I$ |
| $u = 0.665379 + 0.776145I$<br>$a = 0.635938 - 0.460788I$<br>$b = -0.589255 - 1.034860I$ | $-0.77598 + 2.47863I$ | $0.24297 - 1.77615I$ |
| $u = 0.665379 + 0.776145I$<br>$a = 0.110839 - 1.231880I$<br>$b = 0.688258 + 0.559125I$ | $-0.77598 + 2.47863I$ | $0.24297 - 1.77615I$ |
| $u = 0.665379 - 0.776145I$<br>$a = 0.635938 + 0.460788I$<br>$b = -0.589255 + 1.034860I$ | $-0.77598 - 2.47863I$ | $0.24297 + 1.77615I$ |
| $u = 0.665379 - 0.776145I$<br>$a = 0.110839 + 1.231880I$<br>$b = 0.688258 - 0.559125I$ | $-0.77598 - 2.47863I$ | $0.24297 + 1.77615I$ |
| $u = -0.949159$<br>$a = 0.675796 + 0.350096I$<br>$b = -0.692476 + 0.839598I$ | $3.39234$ | $3.61540$ |
| $u = -0.949159$<br>$a = 0.675796 - 0.350096I$<br>$b = -0.692476 - 0.839598I$ | $3.39234$ | $3.61540$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.613502 + 0.901064I$<br>$a = 0.759830 - 0.160326I$<br>$b = -0.702709 - 0.395207I$ | $0.98851 + 2.36009I$ | $3.77869 - 2.94560I$ |
| $u = -0.613502 + 0.901064I$<br>$a = -0.213518 + 1.274820I$<br>$b = 0.731665 - 0.610211I$ | $0.98851 + 2.36009I$ | $3.77869 - 2.94560I$ |
| $u = -0.613502 - 0.901064I$<br>$a = 0.759830 + 0.160326I$<br>$b = -0.702709 + 0.395207I$ | $0.98851 - 2.36009I$ | $3.77869 + 2.94560I$ |
| $u = -0.613502 - 0.901064I$<br>$a = -0.213518 - 1.274820I$<br>$b = 0.731665 + 0.610211I$ | $0.98851 - 2.36009I$ | $3.77869 + 2.94560I$ |
| $u = 0.234138 + 0.867139I$<br>$a = 0.767729 + 0.625996I$<br>$b = -0.302796 + 1.009580I$ | $0.87226 - 5.71730I$ | $1.14087 + 8.70218I$ |
| $u = 0.234138 + 0.867139I$<br>$a = -3.20869 + 0.72540I$<br>$b = 0.660835 - 0.903263I$ | $0.87226 - 5.71730I$ | $1.14087 + 8.70218I$ |
| $u = 0.234138 - 0.867139I$<br>$a = 0.767729 - 0.625996I$<br>$b = -0.302796 - 1.009580I$ | $0.87226 + 5.71730I$ | $1.14087 - 8.70218I$ |
| $u = 0.234138 - 0.867139I$<br>$a = -3.20869 - 0.72540I$<br>$b = 0.660835 + 0.903263I$ | $0.87226 + 5.71730I$ | $1.14087 - 8.70218I$ |
| $u = -0.702940 + 0.870739I$<br>$a = 0.621937 + 0.465792I$<br>$b = -0.595356 + 1.060450I$ | $-2.09778 + 2.69718I$ | $-1.77480 - 3.09544I$ |
| $u = -0.702940 + 0.870739I$<br>$a = -2.43936 + 1.09343I$<br>$b = 0.644093 + 1.024190I$ | $-2.09778 + 2.69718I$ | $-1.77480 - 3.09544I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.702940-0.870739I$<br>$a=\ \ 0.621937-0.465792I$<br>$b=-0.595356-1.060450I$ | $-2.09778-2.69718I$ | $-1.77480+3.09544I$ |
| $u=-0.702940-0.870739I$<br>$a=-2.43936-1.09343I$<br>$b=\ \ 0.644093-1.024190I$ | $-2.09778-2.69718I$ | $-1.77480+3.09544I$ |
| $u=\ \ 0.788902+0.806240I$<br>$a=\ \ 0.733919+0.201231I$<br>$b=-0.735371+0.501044I$ | $-4.43280-1.52216I$ | $-3.69925+2.61889I$ |
| $u=\ \ 0.788902+0.806240I$<br>$a=\ \ 0.842836+1.040260I$<br>$b=-0.006541+1.075980I$ | $-4.43280-1.52216I$ | $-3.69925+2.61889I$ |
| $u=\ \ 0.788902-0.806240I$<br>$a=\ \ 0.733919-0.201231I$<br>$b=-0.735371-0.501044I$ | $-4.43280+1.52216I$ | $-3.69925-2.61889I$ |
| $u=\ \ 0.788902-0.806240I$<br>$a=\ \ 0.842836-1.040260I$<br>$b=-0.006541-1.075980I$ | $-4.43280+1.52216I$ | $-3.69925-2.61889I$ |
| $u=\ \ 0.920485+0.670333I$<br>$a=\ \ 0.621962-0.425064I$<br>$b=-0.657901-1.017940I$ | $-0.37164+4.66065I$ | $0.61587-2.80152I$ |
| $u=\ \ 0.920485+0.670333I$<br>$a=\ \ 0.712997+0.235993I$<br>$b=-0.751562+0.591432I$ | $-0.37164+4.66065I$ | $0.61587-2.80152I$ |
| $u=\ \ 0.920485-0.670333I$<br>$a=\ \ 0.621962+0.425064I$<br>$b=-0.657901+1.017940I$ | $-0.37164-4.66065I$ | $0.61587+2.80152I$ |
| $u=\ \ 0.920485-0.670333I$<br>$a=\ \ 0.712997-0.235993I$<br>$b=-0.751562-0.591432I$ | $-0.37164-4.66065I$ | $0.61587+2.80152I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.845575 + 0.795122I$<br>$a = 0.616836 + 0.443798I$<br>$b = -0.634247 + 1.046440I$ | $-5.99253 - 3.68906I$ | $-6.07547 + 2.52126I$ |
| $u = -0.845575 + 0.795122I$<br>$a = 0.816085 - 1.096950I$<br>$b = 0.018187 - 1.093160I$ | $-5.99253 - 3.68906I$ | $-6.07547 + 2.52126I$ |
| $u = -0.845575 - 0.795122I$<br>$a = 0.616836 - 0.443798I$<br>$b = -0.634247 - 1.046440I$ | $-5.99253 + 3.68906I$ | $-6.07547 - 2.52126I$ |
| $u = -0.845575 - 0.795122I$<br>$a = 0.816085 + 1.096950I$<br>$b = 0.018187 + 1.093160I$ | $-5.99253 + 3.68906I$ | $-6.07547 - 2.52126I$ |
| $u = 0.679751 + 0.948328I$<br>$a = 0.740250 + 0.160964I$<br>$b = -0.746944 + 0.406974I$ | $-0.22436 - 7.71485I$ | $1.58056 + 7.57230I$ |
| $u = 0.679751 + 0.948328I$<br>$a = -2.35312 - 0.86592I$<br>$b = 0.664524 - 1.021430I$ | $-0.22436 - 7.71485I$ | $1.58056 + 7.57230I$ |
| $u = 0.679751 - 0.948328I$<br>$a = 0.740250 - 0.160964I$<br>$b = -0.746944 - 0.406974I$ | $-0.22436 + 7.71485I$ | $1.58056 - 7.57230I$ |
| $u = 0.679751 - 0.948328I$<br>$a = -2.35312 + 0.86592I$<br>$b = 0.664524 + 1.021430I$ | $-0.22436 + 7.71485I$ | $1.58056 - 7.57230I$ |
| $u = -0.105432 + 0.816987I$<br>$a = 0.746933 - 0.576307I$<br>$b = -0.361341 - 0.997749I$ | $1.188190 + 0.603355I$ | $3.29363 - 1.93093I$ |
| $u = -0.105432 + 0.816987I$<br>$a = -1.96741 + 2.42976I$<br>$b = 0.654202 - 0.802439I$ | $1.188190 + 0.603355I$ | $3.29363 - 1.93093I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.105432 - 0.816987I$<br>$a = 0.746933 + 0.576307I$<br>$b = -0.361341 + 0.997749I$ | $1.188190 - 0.603355I$ | $3.29363 + 1.93093I$ |
| $u = -0.105432 - 0.816987I$<br>$a = -1.96741 - 2.42976I$<br>$b = 0.654202 + 0.802439I$ | $1.188190 - 0.603355I$ | $3.29363 + 1.93093I$ |
| $u = 0.750104 + 0.942029I$<br>$a = -0.186018 - 1.000410I$<br>$b = 0.778688 + 0.566100I$ | $-4.01232 - 4.27816I$ | $-2.78151 + 3.10265I$ |
| $u = 0.750104 + 0.942029I$<br>$a = 0.751867 + 0.949236I$<br>$b = -0.065283 + 1.116190I$ | $-4.01232 - 4.27816I$ | $-2.78151 + 3.10265I$ |
| $u = 0.750104 - 0.942029I$<br>$a = -0.186018 + 1.000410I$<br>$b = 0.778688 - 0.566100I$ | $-4.01232 + 4.27816I$ | $-2.78151 - 3.10265I$ |
| $u = 0.750104 - 0.942029I$<br>$a = 0.751867 - 0.949236I$<br>$b = -0.065283 - 1.116190I$ | $-4.01232 + 4.27816I$ | $-2.78151 - 3.10265I$ |
| $u = -0.267647 + 1.175100I$<br>$a = -1.17158 + 1.12572I$<br>$b = 0.782054 - 0.772553I$ | $7.64872 + 4.10928I$ | $6.76207 - 3.53487I$ |
| $u = -0.267647 + 1.175100I$<br>$a = -2.10317 - 0.34278I$<br>$b = 0.742093 + 0.926355I$ | $7.64872 + 4.10928I$ | $6.76207 - 3.53487I$ |
| $u = -0.267647 - 1.175100I$<br>$a = -1.17158 - 1.12572I$<br>$b = 0.782054 + 0.772553I$ | $7.64872 - 4.10928I$ | $6.76207 + 3.53487I$ |
| $u = -0.267647 - 1.175100I$<br>$a = -2.10317 + 0.34278I$<br>$b = 0.742093 - 0.926355I$ | $7.64872 - 4.10928I$ | $6.76207 + 3.53487I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.777774 + 0.973678I$<br>$a = 0.721347 - 0.956074I$<br>$b = -0.063549 - 1.135640I$ | $-5.43107 + 9.74498I$ | $-4.76319 - 7.62687I$ |
| $u = -0.777774 + 0.973678I$<br>$a = -2.11190 + 0.96967I$<br>$b = 0.666975 + 1.046950I$ | $-5.43107 + 9.74498I$ | $-4.76319 - 7.62687I$ |
| $u = -0.777774 - 0.973678I$<br>$a = 0.721347 + 0.956074I$<br>$b = -0.063549 + 1.135640I$ | $-5.43107 - 9.74498I$ | $-4.76319 + 7.62687I$ |
| $u = -0.777774 - 0.973678I$<br>$a = -2.11190 - 0.96967I$<br>$b = 0.666975 - 1.046950I$ | $-5.43107 - 9.74498I$ | $-4.76319 + 7.62687I$ |
| $u = 0.759296 + 1.058880I$<br>$a = -0.337168 - 0.916661I$<br>$b = 0.821726 + 0.590691I$ | $0.83529 - 10.84000I$ | $1.88810 + 6.73875I$ |
| $u = 0.759296 + 1.058880I$<br>$a = -2.02862 - 0.79380I$<br>$b = 0.688861 - 1.045760I$ | $0.83529 - 10.84000I$ | $1.88810 + 6.73875I$ |
| $u = 0.759296 - 1.058880I$<br>$a = -0.337168 + 0.916661I$<br>$b = 0.821726 - 0.590691I$ | $0.83529 + 10.84000I$ | $1.88810 - 6.73875I$ |
| $u = 0.759296 - 1.058880I$<br>$a = -2.02862 + 0.79380I$<br>$b = 0.688861 + 1.045760I$ | $0.83529 + 10.84000I$ | $1.88810 - 6.73875I$ |
| $u = 0.525723 + 0.430540I$<br>$a = 0.685556 - 0.437340I$<br>$b = -0.568437 - 0.942925I$ | $-0.58470 + 2.92924I$ | $-3.69112 - 1.50327I$ |
| $u = 0.525723 + 0.430540I$<br>$a = 1.65240 + 0.02104I$<br>$b = 0.192277 + 0.600483I$ | $-0.58470 + 2.92924I$ | $-3.69112 - 1.50327I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.525723 - 0.430540I$<br>$a = 0.685556 + 0.437340I$<br>$b = -0.568437 + 0.942925I$ | $-0.58470 - 2.92924I$ | $-3.69112 + 1.50327I$ |
| $u = 0.525723 - 0.430540I$<br>$a = 1.65240 - 0.02104I$<br>$b = 0.192277 - 0.600483I$ | $-0.58470 - 2.92924I$ | $-3.69112 + 1.50327I$ |
| $u = -0.486625 + 0.301249I$<br>$a = 1.095810 + 0.119505I$<br>$b = 0.185860 - 0.292702I$ | $0.09834 + 1.49688I$ | $-1.55937 - 4.19988I$ |
| $u = -0.486625 + 0.301249I$<br>$a = 0.781578 - 0.368136I$<br>$b = -0.519509 - 0.755598I$ | $0.09834 + 1.49688I$ | $-1.55937 - 4.19988I$ |
| $u = -0.486625 - 0.301249I$<br>$a = 1.095810 - 0.119505I$<br>$b = 0.185860 + 0.292702I$ | $0.09834 - 1.49688I$ | $-1.55937 + 4.19988I$ |
| $u = -0.486625 - 0.301249I$<br>$a = 0.781578 + 0.368136I$<br>$b = -0.519509 + 0.755598I$ | $0.09834 - 1.49688I$ | $-1.55937 + 4.19988I$ |

## III. $I_1^v = \langle a,\ b^2 + b + 1,\ v + 1 \rangle$

**(i) Arc colorings**

$$a_3 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

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

$$a_4 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} 0 \\ b \end{pmatrix}$$

$$a_2 = \begin{pmatrix} 1 \\ -b - 1 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} b \\ b + 1 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} -b \\ -b - 1 \end{pmatrix}$$

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

$$a_{10} = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 0 \\ -b \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} -b \\ -b \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 8b + 4$

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

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

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

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

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

| Solutions to $I_1^v$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $v = -1.00000$<br>$a = 0$<br>$b = -0.500000 + 0.866025I$ | $-4.05977I$ | $0. + 6.92820I$ |
| $v = -1.00000$<br>$a = 0$<br>$b = -0.500000 - 0.866025I$ | $4.05977I$ | $0. - 6.92820I$ |

### IV. $I_2^v = \langle a,\ b - v + 1,\ v^2 - v + 1\rangle$

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= -3$

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

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

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

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

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

| Solutions to $I_2^v$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $v = \quad 0.500000 + 0.866025I$<br>$a = \quad 0$<br>$b = -0.500000 + 0.866025I$ | 0 | $-3.00000$ |
| $v = \quad 0.500000 - 0.866025I$<br>$a = \quad 0$<br>$b = -0.500000 - 0.866025I$ | 0 | $-3.00000$ |

## V. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_4, c_{10}$ | $((u^2-u+1)^2)(u^{20}+7u^{19}+\cdots+6u+1)(u^{66}+24u^{65}+\cdots+17u+1)$ |
| $c_2, c_6$ | $((u^2+u+1)^2)(u^{20}+u^{19}+\cdots-2u+1)(u^{66}+2u^{65}+\cdots+u+1)$ |
| $c_3, c_8$ | $u^4(u^{20}+5u^{19}+\cdots+12u+4)(u^{33}-2u^{32}+\cdots-u+2)^2$ |
| $c_5, c_{11}$ | $((u^2-u+1)^2)(u^{20}+u^{19}+\cdots-2u+1)(u^{66}+2u^{65}+\cdots+u+1)$ |
| $c_7, c_9$ | $u^4(u^{20}-5u^{19}+\cdots-48u+16)(u^{33}-10u^{32}+\cdots-23u+4)^2$ |
| $c_{12}$ | $((u^2+u+1)^2)(u^{20}+7u^{19}+\cdots+6u+1)(u^{66}+24u^{65}+\cdots+17u+1)$ |

## VI. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4, c_{10}$<br>$c_{12}$ | $((y^2+y+1)^2)(y^{20}+15y^{19}+\cdots+42y+1)$<br>$\cdot(y^{66}+36y^{65}+\cdots+97y+1)$ |
| $c_2, c_5, c_6$<br>$c_{11}$ | $((y^2+y+1)^2)(y^{20}+7y^{19}+\cdots+6y+1)(y^{66}+24y^{65}+\cdots+17y+1)$ |
| $c_3, c_8$ | $y^4(y^{20}+5y^{19}+\cdots+48y+16)(y^{33}+10y^{32}+\cdots-23y-4)^2$ |
| $c_7, c_9$ | $y^4(y^{20}+13y^{19}+\cdots+2560y+256)$<br>$\cdot(y^{33}+26y^{32}+\cdots-335y-16)^2$ |