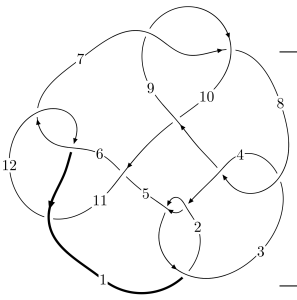
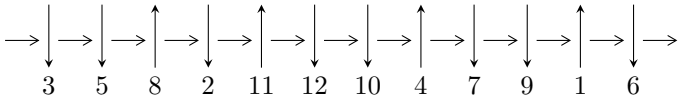
## $12a_{0113}$ $(K12a_{0113})$




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$\begin{aligned}
I_1^u = \langle & 2.57614 \times 10^{61} u^{45} - 5.16765 \times 10^{61} u^{44} + \cdots + 1.04756 \times 10^{63} d - 8.34150 \times 10^{62}, \\
& - 1.37440 \times 10^{61} u^{45} + 5.43427 \times 10^{61} u^{44} + \cdots + 2.09512 \times 10^{63} c + 1.27330 \times 10^{63}, \\
& - 2.25361 \times 10^{61} u^{45} + 4.71945 \times 10^{61} u^{44} + \cdots + 1.04756 \times 10^{63} b + 2.14640 \times 10^{62}, \\
& 1.04662 \times 10^{62} u^{45} - 2.24346 \times 10^{62} u^{44} + \cdots + 2.09512 \times 10^{63} a - 4.78844 \times 10^{63},\ u^{46} - 3u^{45} + \cdots - 32u + \\
I_2^u = \langle & -2.67306 \times 10^{20} a u^{37} + 1.38721 \times 10^{19} u^{37} + \cdots + 1.33819 \times 10^{21} a - 9.87299 \times 10^{20}, \\
& 3.11246 \times 10^{20} a u^{37} - 2.82340 \times 10^{20} u^{37} + \cdots + 4.88853 \times 10^{19} a + 1.51002 \times 10^{20}, \\
& - 6.51406 \times 10^{19} a u^{37} + 1.38360 \times 10^{20} u^{37} + \cdots + 2.42874 \times 10^{20} a - 6.50377 \times 10^{20}, \\
& - 8.51184 \times 10^{19} a u^{37} + 2.87125 \times 10^{20} u^{37} + \cdots - 2.71211 \times 10^{21} a + 1.26240 \times 10^{21},\ u^{38} + u^{37} + \cdots + 4u -
\end{aligned}$$

$$\begin{aligned}
I_1^v &= \langle a,\ d,\ c - v,\ b - 1,\ v^2 - v + 1 \rangle \\
I_2^v &= \langle c,\ d + v - 1,\ b,\ a - 1,\ v^2 - v + 1 \rangle \\
I_3^v &= \langle a,\ d + 1,\ c + a,\ b - 1,\ v + 1 \rangle \\
I_4^v &= \langle a,\ a^2 d + c^2 v - 2ca + cv - a + v,\ dv - 1,\ c^2 v^2 - 2cav + v^2 c + a^2 - av + v^2,\ b - 1 \rangle
\end{aligned}$$

* 5 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 127 representations.
* 1 irreducible components of $\dim_{\mathbb{C}} = 1$

[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.**

$$I_1^u = \langle \mathbf{2.58\times 10^{61}u^{45}-5.17\times 10^{61}u^{44}+\cdots+1.05\times 10^{63}d-8.34\times 10^{62},\ -1.37\times 10^{61}u^{45}+5.43\times 10^{61}u^{44}+\cdots+2.10\times 10^{63}c+1.27\times 10^{63},\ -2.25\times 10^{61}u^{45}+4.72\times 10^{61}u^{44}+\cdots+1.05\times 10^{63}b+2.15\times 10^{62},\ 1.05\times 10^{62}u^{45}-2.24\times 10^{62}u^{44}+\cdots+2.10\times 10^{63}a-4.79\times 10^{63},\ u^{46}-3u^{45}+\cdots-32u+32}\rangle$$

**(i) Arc colorings**

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

$$a_8 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} -0.0499550u^{45}+0.107080u^{44}+\cdots+0.105000u+2.28551 \\ 0.0215129u^{45}-0.0450517u^{44}+\cdots+0.210607u-0.204895 \end{pmatrix}$$

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

$$a_2 = \begin{pmatrix} -0.0499550u^{45}+0.107080u^{44}+\cdots+0.105000u+2.28551 \\ 0.0188136u^{45}-0.0434778u^{44}+\cdots-0.440044u-1.16423 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} -0.0311414u^{45}+0.0636021u^{44}+\cdots-0.335044u+1.12129 \\ 0.0188136u^{45}-0.0434778u^{44}+\cdots-0.440044u-1.16423 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 0.00655998u^{45}-0.0259377u^{44}+\cdots+2.00677u-0.607746 \\ -0.0245918u^{45}+0.0493302u^{44}+\cdots+0.534931u+0.796277 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} -0.00367220u^{45}-0.0105532u^{44}+\cdots+1.80694u+0.0421140 \\ -0.0300186u^{45}+0.0694063u^{44}+\cdots-0.0507359u+1.20714 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} -0.00640297u^{45}-0.00230401u^{44}+\cdots+2.56896u-0.00571168 \\ -0.0232980u^{45}+0.0442495u^{44}+\cdots+1.17047u+0.910145 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -0.0363821u^{45}+0.0903327u^{44}+\cdots-1.88200u+1.60427 \\ -0.0298221u^{45}+0.0643950u^{44}+\cdots+0.124764u+0.996524 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} -0.0377231u^{45}+0.0831509u^{44}+\cdots-1.46595u+1.15640 \\ 0.0215698u^{45}-0.0484849u^{44}+\cdots+0.0753964u-0.117510 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -0.247381u^{45}+0.445802u^{44}+\cdots+4.44172u+0.790830$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_{10}$ | $u^{46} + 21u^{45} + \cdots - 4u + 1$ |
| $c_2, c_4, c_7$ $c_9$ | $u^{46} - 5u^{45} + \cdots - 2u + 1$ |
| $c_3, c_8$ | $u^{46} + 3u^{45} + \cdots + 32u + 32$ |
| $c_5$ | $u^{46} + u^{45} + \cdots + 2596u + 1252$ |
| $c_6, c_{12}$ | $u^{46} - u^{45} + \cdots + 4u + 4$ |
| $c_{11}$ | $u^{46} - 21u^{45} + \cdots + 40u + 16$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_{10}$ | $y^{46} + 19y^{45} + \cdots - 72y + 1$ |
| $c_2, c_4, c_7$ $c_9$ | $y^{46} - 21y^{45} + \cdots + 4y + 1$ |
| $c_3, c_8$ | $y^{46} - 15y^{45} + \cdots + 4096y + 1024$ |
| $c_5$ | $y^{46} - 3y^{45} + \cdots - 20408552y + 1567504$ |
| $c_6, c_{12}$ | $y^{46} + 21y^{45} + \cdots - 40y + 16$ |
| $c_{11}$ | $y^{46} + 9y^{45} + \cdots - 5664y + 256$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.248116 + 0.949341I$<br>$a = 0.589922 + 0.247257I$<br>$b = 0.441845 - 0.604328I$<br>$c = 0.017203 + 0.885277I$<br>$d = -0.12168 + 1.65051I$ | $1.66114 - 2.12776I$ | $0.422256 + 0.234121I$ |
| $u = 0.248116 - 0.949341I$<br>$a = 0.589922 - 0.247257I$<br>$b = 0.441845 + 0.604328I$<br>$c = 0.017203 - 0.885277I$<br>$d = -0.12168 - 1.65051I$ | $1.66114 + 2.12776I$ | $0.422256 - 0.234121I$ |
| $u = -0.642875 + 0.814816I$<br>$a = 0.455077 + 0.085949I$<br>$b = 1.121750 - 0.400729I$<br>$c = 0.945725 - 0.863065I$<br>$d = 0.751792 - 0.382393I$ | $-5.93091 + 3.99675I$ | $-10.51051 - 4.44974I$ |
| $u = -0.642875 - 0.814816I$<br>$a = 0.455077 - 0.085949I$<br>$b = 1.121750 + 0.400729I$<br>$c = 0.945725 + 0.863065I$<br>$d = 0.751792 + 0.382393I$ | $-5.93091 - 3.99675I$ | $-10.51051 + 4.44974I$ |
| $u = -0.046642 + 1.050320I$<br>$a = 0.521824 + 0.180773I$<br>$b = 0.711017 - 0.592739I$<br>$c = -0.284880 + 0.449331I$<br>$d = -1.45000 + 0.80516I$ | $2.04690 + 4.94372I$ | $-0.16550 - 7.58166I$ |
| $u = -0.046642 - 1.050320I$<br>$a = 0.521824 - 0.180773I$<br>$b = 0.711017 + 0.592739I$<br>$c = -0.284880 - 0.449331I$<br>$d = -1.45000 - 0.80516I$ | $2.04690 - 4.94372I$ | $-0.16550 + 7.58166I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.614432 + 0.696436I$ | | |
| $a = 0.462583 - 0.072566I$ | | |
| $b = 1.109850 + 0.330974I$ | $-4.70063 + 1.01560I$ | $-8.78023 - 1.30126I$ |
| $c = -1.235720 - 0.572618I$ | | |
| $d = -0.466020 + 0.040614I$ | | |
| $u = 0.614432 - 0.696436I$ | | |
| $a = 0.462583 + 0.072566I$ | | |
| $b = 1.109850 - 0.330974I$ | $-4.70063 - 1.01560I$ | $-8.78023 + 1.30126I$ |
| $c = -1.235720 + 0.572618I$ | | |
| $d = -0.466020 - 0.040614I$ | | |
| $u = 0.904459 + 0.035006I$ | | |
| $a = 0.99383 - 1.43056I$ | | |
| $b = -0.672458 + 0.471479I$ | $-0.23417 + 4.06154I$ | $-0.42563 - 7.90074I$ |
| $c = 0.492096 + 0.016232I$ | | |
| $d = 0.317889 - 0.738045I$ | | |
| $u = 0.904459 - 0.035006I$ | | |
| $a = 0.99383 + 1.43056I$ | | |
| $b = -0.672458 - 0.471479I$ | $-0.23417 - 4.06154I$ | $-0.42563 + 7.90074I$ |
| $c = 0.492096 - 0.016232I$ | | |
| $d = 0.317889 + 0.738045I$ | | |
| $u = 0.517103 + 1.038360I$ | | |
| $a = 0.457040 - 0.120254I$ | | |
| $b = 1.046330 + 0.538419I$ | $-0.12548 - 4.11136I$ | $-2.46017 + 3.87123I$ |
| $c = -0.063868 - 0.817891I$ | | |
| $d = 0.18483 - 1.60057I$ | | |
| $u = 0.517103 - 1.038360I$ | | |
| $a = 0.457040 + 0.120254I$ | | |
| $b = 1.046330 - 0.538419I$ | $-0.12548 + 4.11136I$ | $-2.46017 - 3.87123I$ |
| $c = -0.063868 + 0.817891I$ | | |
| $d = 0.18483 + 1.60057I$ | | |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.017678 + 0.820472I$ | | |
| $a = 0.576889 - 0.137924I$ | | |
| $b = 0.639709 + 0.392026I$ | $-0.79101 - 1.46703I$ | $-5.32252 + 4.75359I$ |
| $c = -0.087372 + 0.550499I$ | | |
| $d = 0.487544 + 0.625296I$ | | |
| $u = 0.017678 - 0.820472I$ | | |
| $a = 0.576889 + 0.137924I$ | | |
| $b = 0.639709 - 0.392026I$ | $-0.79101 + 1.46703I$ | $-5.32252 - 4.75359I$ |
| $c = -0.087372 - 0.550499I$ | | |
| $d = 0.487544 - 0.625296I$ | | |
| $u = 1.006520 + 0.624064I$ | | |
| $a = -0.40042 - 1.85496I$ | | |
| $b = -1.111190 + 0.515094I$ | $-3.52144 + 4.08819I$ | $-5.82465 - 4.54278I$ |
| $c = -1.121880 - 0.316865I$ | | |
| $d = -0.633971 + 0.037265I$ | | |
| $u = 1.006520 - 0.624064I$ | | |
| $a = -0.40042 + 1.85496I$ | | |
| $b = -1.111190 - 0.515094I$ | $-3.52144 - 4.08819I$ | $-5.82465 + 4.54278I$ |
| $c = -1.121880 + 0.316865I$ | | |
| $d = -0.633971 - 0.037265I$ | | |
| $u = -1.071740 + 0.508840I$ | | |
| $a = 0.613457 - 0.718385I$ | | |
| $b = -0.312581 + 0.804998I$ | $1.98761 - 2.55534I$ | $-0.98949 + 1.01939I$ |
| $c = -1.374890 + 0.240606I$ | | |
| $d = -0.176960 - 0.890915I$ | | |
| $u = -1.071740 - 0.508840I$ | | |
| $a = 0.613457 + 0.718385I$ | | |
| $b = -0.312581 - 0.804998I$ | $1.98761 + 2.55534I$ | $-0.98949 - 1.01939I$ |
| $c = -1.374890 - 0.240606I$ | | |
| $d = -0.176960 + 0.890915I$ | | |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.807683+0.082878I$<br>$a=\ \ 1.21197-1.05036I$<br>$b=-0.528808+0.408361I$<br>$c=-0.643863+0.075660I$<br>$d=-0.430989+0.455586I$ | $-0.274017-1.087600I$ | $0.651009-0.594713I$ |
| $u=-0.807683-0.082878I$<br>$a=\ \ 1.21197+1.05036I$<br>$b=-0.528808-0.408361I$<br>$c=-0.643863-0.075660I$<br>$d=-0.430989-0.455586I$ | $-0.274017+1.087600I$ | $0.651009+0.594713I$ |
| $u=-0.668777+1.013930I$<br>$a=\ \ 0.441760+0.107066I$<br>$b=\ \ 1.138080-0.518189I$<br>$c=\ \ 0.362758-1.282570I$<br>$d=\ \ 1.03682-1.70646I$ | $-4.90536+6.51831I$ | $-8.90536-4.64881I$ |
| $u=-0.668777-1.013930I$<br>$a=\ \ 0.441760-0.107066I$<br>$b=\ \ 1.138080+0.518189I$<br>$c=\ \ 0.362758+1.282570I$<br>$d=\ \ 1.03682+1.70646I$ | $-4.90536-6.51831I$ | $-8.90536+4.64881I$ |
| $u=-1.035500+0.682470I$<br>$a=-0.48479+1.75097I$<br>$b=-1.146870-0.530449I$<br>$c=\ \ 1.364230-0.311759I$<br>$d=\ \ 0.821257+0.527558I$ | $-4.70874-9.62616I$ | $-7.79470+8.99124I$ |
| $u=-1.035500-0.682470I$<br>$a=-0.48479-1.75097I$<br>$b=-1.146870+0.530449I$<br>$c=\ \ 1.364230+0.311759I$<br>$d=\ \ 0.821257-0.527558I$ | $-4.70874+9.62616I$ | $-7.79470-8.99124I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.224990 + 0.226721I$<br>$a = 0.26109 - 1.40376I$<br>$b = -0.871935 + 0.688553I$<br>$c = -0.035155 + 0.735172I$<br>$d = 0.474612 - 1.300260I$ | $3.57586 + 5.30392I$ | $-1.93777 - 5.96454I$ |
| $u = 1.224990 - 0.226721I$<br>$a = 0.26109 + 1.40376I$<br>$b = -0.871935 - 0.688553I$<br>$c = -0.035155 - 0.735172I$<br>$d = 0.474612 + 1.300260I$ | $3.57586 - 5.30392I$ | $-1.93777 + 5.96454I$ |
| $u = 1.195740 + 0.364671I$<br>$a = 0.555749 + 0.845299I$<br>$b = -0.456951 - 0.825982I$<br>$c = 1.383760 - 0.204608I$<br>$d = -0.775236 - 0.457994I$ | $6.39735 - 0.44189I$ | $4.43091 + 2.06201I$ |
| $u = 1.195740 - 0.364671I$<br>$a = 0.555749 - 0.845299I$<br>$b = -0.456951 + 0.825982I$<br>$c = 1.383760 + 0.204608I$<br>$d = -0.775236 + 0.457994I$ | $6.39735 + 0.44189I$ | $4.43091 - 2.06201I$ |
| $u = 0.687704 + 1.079720I$<br>$a = 0.435637 - 0.112607I$<br>$b = 1.151720 + 0.556193I$<br>$c = -0.16597 - 1.45383I$<br>$d = -1.16901 - 2.34716I$ | $-2.74057 - 11.63170I$ | $-5.60201 + 8.64749I$ |
| $u = 0.687704 - 1.079720I$<br>$a = 0.435637 + 0.112607I$<br>$b = 1.151720 - 0.556193I$<br>$c = -0.16597 + 1.45383I$<br>$d = -1.16901 + 2.34716I$ | $-2.74057 + 11.63170I$ | $-5.60201 - 8.64749I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.158970 + 0.578549I$<br>$a = 0.544904 + 0.699989I$<br>$b = -0.307535 - 0.889547I$<br>$c = 1.64315 + 0.27736I$<br>$d = 0.06540 - 1.58776I$ | $4.42926 + 7.47789I$ | $1.74286 - 4.84208I$ |
| $u = 1.158970 - 0.578549I$<br>$a = 0.544904 - 0.699989I$<br>$b = -0.307535 + 0.889547I$<br>$c = 1.64315 - 0.27736I$<br>$d = 0.06540 + 1.58776I$ | $4.42926 - 7.47789I$ | $1.74286 + 4.84208I$ |
| $u = -1.311140 + 0.102134I$<br>$a = 0.311679 + 1.221780I$<br>$b = -0.803961 - 0.768470I$<br>$c = -0.364729 + 0.984342I$<br>$d = 0.02550 - 1.73526I$ | $7.51022 - 1.50301I$ | $3.10935 + 2.27720I$ |
| $u = -1.311140 - 0.102134I$<br>$a = 0.311679 - 1.221780I$<br>$b = -0.803961 + 0.768470I$<br>$c = -0.364729 - 0.984342I$<br>$d = 0.02550 + 1.73526I$ | $7.51022 + 1.50301I$ | $3.10935 - 2.27720I$ |
| $u = -0.435796 + 0.485308I$<br>$a = 0.857168 - 0.309306I$<br>$b = 0.032227 + 0.372475I$<br>$c = -0.440235 + 0.495589I$<br>$d = -0.501506 + 0.464460I$ | $0.084212 - 1.381070I$ | $0.30299 + 4.86269I$ |
| $u = -0.435796 - 0.485308I$<br>$a = 0.857168 + 0.309306I$<br>$b = 0.032227 - 0.372475I$<br>$c = -0.440235 - 0.495589I$<br>$d = -0.501506 - 0.464460I$ | $0.084212 + 1.381070I$ | $0.30299 - 4.86269I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-1.316840+0.304432I$<br>$a=\ \ 0.116039+1.346760I$<br>$b=-0.936495-0.737050I$<br>$c=\ \ 0.307546+1.028890I$<br>$d=-1.03275-1.46411I$ | $6.69471-9.89538I$ | $1.12698+9.02462I$ |
| $u=-1.316840-0.304432I$<br>$a=\ \ 0.116039-1.346760I$<br>$b=-0.936495+0.737050I$<br>$c=\ \ 0.307546-1.028890I$<br>$d=-1.03275+1.46411I$ | $6.69471+9.89538I$ | $1.12698-9.02462I$ |
| $u=-1.118430+0.781907I$<br>$a=-0.55775+1.54027I$<br>$b=-1.207840-0.573976I$<br>$c=\ \ 1.86293-0.18421I$<br>$d=\ \ 0.89762+1.88496I$ | $-3.44989-13.07100I$ | $-7.52581+7.90184I$ |
| $u=-1.118430-0.781907I$<br>$a=-0.55775-1.54027I$<br>$b=-1.207840+0.573976I$<br>$c=\ \ 1.86293+0.18421I$<br>$d=\ \ 0.89762-1.88496I$ | $-3.44989+13.07100I$ | $-7.52581-7.90184I$ |
| $u=\ \ 1.166960+0.709743I$<br>$a=-0.42776-1.53120I$<br>$b=-1.169240+0.605803I$<br>$c=-1.67165+0.11957I$<br>$d=\ \ 0.04746+1.51937I$ | $1.96462+10.42030I$ | $0.-7.01224I$ |
| $u=\ \ 1.166960-0.709743I$<br>$a=-0.42776+1.53120I$<br>$b=-1.169240-0.605803I$<br>$c=-1.67165-0.11957I$<br>$d=\ \ 0.04746-1.51937I$ | $1.96462-10.42030I$ | $0.+7.01224I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.144720 + 0.813548I$<br>$a = -0.57296 - 1.48160I$<br>$b = -1.227060 + 0.587138I$<br>$c = -2.03119 - 0.14199I$<br>$d = -0.89891 + 2.41812I$ | $-1.2351 + 18.4885I$ | $-4.00000 - 11.60486I$ |
| $u = 1.144720 - 0.813548I$<br>$a = -0.57296 + 1.48160I$<br>$b = -1.227060 - 0.587138I$<br>$c = -2.03119 + 0.14199I$<br>$d = -0.89891 - 2.41812I$ | $-1.2351 - 18.4885I$ | $-4.00000 + 11.60486I$ |
| $u = 0.068034 + 0.485475I$<br>$a = 0.537064 - 0.015658I$<br>$b = 0.860393 + 0.054239I$<br>$c = -0.358003 + 1.358470I$<br>$d = 0.046305 + 0.232893I$ | $-2.91211 - 2.24138I$ | $-11.31463 + 3.80305I$ |
| $u = 0.068034 - 0.485475I$<br>$a = 0.537064 + 0.015658I$<br>$b = 0.860393 - 0.054239I$<br>$c = -0.358003 - 1.358470I$<br>$d = 0.046305 - 0.232893I$ | $-2.91211 + 2.24138I$ | $-11.31463 - 3.80305I$ |

**II.** $\boldsymbol{I_2^u = \langle -2.67\times 10^{20}au^{37} + 1.39\times 10^{19}u^{37} + \cdots + 1.34\times 10^{21}a - 9.87\times 10^{20},\ 3.11\times 10^{20}au^{37} - 2.82\times 10^{20}u^{37} + \cdots + 4.89\times 10^{19}a + 1.51\times 10^{20},\ -6.51\times 10^{19}au^{37} + 1.38\times 10^{20}u^{37} + \cdots + 2.43\times 10^{20}a - 6.50\times 10^{20},\ -8.51\times 10^{19}au^{37} + 2.87\times 10^{20}u^{37} + \cdots - 2.71\times 10^{21}a + 1.26\times 10^{21},\ u^{38} + u^{37} + \cdots + 4u - 4\rangle}$

**(i) Arc colorings**

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

$$a_8 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} a \\ 0.351994au^{37} - 0.747643u^{37} + \cdots - 1.31240a + 3.51438 \end{pmatrix}$$

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

$$a_2 = \begin{pmatrix} a \\ -0.351994au^{37} + 0.747643u^{37} + \cdots + 1.31240a - 3.51438 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} -0.351994au^{37} + 0.747643u^{37} + \cdots + 2.31240a - 3.51438 \\ -0.351994au^{37} + 0.747643u^{37} + \cdots + 1.31240a - 3.51438 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} -0.840926au^{37} + 0.762827u^{37} + \cdots - 0.132078a - 0.407976 \\ 0.722207au^{37} - 0.0374795u^{37} + \cdots - 3.61552a + 2.66749 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} 0.717046au^{37} - 0.375927u^{37} + \cdots - 6.28667a + 4.45469 \\ 1.61990au^{37} - 1.17623u^{37} + \cdots - 6.25098a + 7.53015 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} -0.328099au^{37} + 0.250000u^{37} + \cdots - 1.54005a + 1 \\ 0.512827au^{37} + 0.171901u^{37} + \cdots - 1.40798a + 0.459946 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 0.328099au^{37} - 0.0780990u^{37} + \cdots + 1.54005a - 0.540054 \\ -0.512827au^{37} + 0.684728u^{37} + \cdots + 1.40798a - 0.948030 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 1.56275au^{37} - 0.842508u^{37} + \cdots - 1.04475a + 2.32445 \\ -0.332058au^{37} - 0.0145277u^{37} + \cdots + 2.86819a + 1.41585 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= \frac{125334397169543797937}{92530874909565185306}u^{37} + \frac{144830212205814099033}{9253087490956518306}u^{36} + \cdots + \frac{3422356744753912 4627}{9253087490956518306}u - \frac{22828681601437927 6432}{46265437454782592653}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{76}+43u^{75}+\cdots+800u+256$ |
| $c_2, c_7$ | $u^{76}-3u^{75}+\cdots+104u-16$ |
| $c_3$ | $(u^{38}-u^{37}+\cdots-4u-4)^2$ |
| $c_4, c_9$ | $-u^{76}-3u^{75}+\cdots+104u+16$ |
| $c_5$ | $(u^{38}+2u^{37}+\cdots+37u+17)^2$ |
| $c_6$ | $(u^{38}-2u^{37}+\cdots-5u+1)^2$ |
| $c_8$ | $(u^{38}+u^{37}+\cdots+4u-4)^2$ |
| $c_{10}$ | $u^{76}-43u^{75}+\cdots-800u+256$ |
| $c_{11}$ | $(u^{38}+18u^{37}+\cdots-5u+1)^2$ |
| $c_{12}$ | $(u^{38}+2u^{37}+\cdots+5u+1)^2$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_{10}$ | $y^{76} - 23y^{75} + \cdots - 1516032y + 65536$ |
| $c_2, c_4, c_7$ $c_9$ | $y^{76} - 43y^{75} + \cdots - 800y + 256$ |
| $c_3, c_8$ | $(y^{38} - 15y^{37} + \cdots - 72y + 16)^2$ |
| $c_5$ | $(y^{38} - 6y^{37} + \cdots - 6333y + 289)^2$ |
| $c_6, c_{12}$ | $(y^{38} + 18y^{37} + \cdots - 5y + 1)^2$ |
| $c_{11}$ | $(y^{38} + 6y^{37} + \cdots - 61y + 1)^2$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.718175+0.689913I$<br>$a=\ 0.450629+0.069011I$<br>$b=\ 1.168270-0.332058I$<br>$c=\ 0.82426-1.31061I$<br>$d=\ 1.77249-1.85878I$ | $-6.09366-1.46931I$ | $-10.87065+3.08473I$ |
| $u=-0.718175+0.689913I$<br>$a=-1.05848+2.42146I$<br>$b=-1.151560-0.346723I$<br>$c=\ 1.44273-0.85052I$<br>$d=\ 0.779906+0.302096I$ | $-6.09366-1.46931I$ | $-10.87065+3.08473I$ |
| $u=-0.718175-0.689913I$<br>$a=\ 0.450629-0.069011I$<br>$b=\ 1.168270+0.332058I$<br>$c=\ 0.82426+1.31061I$<br>$d=\ 1.77249+1.85878I$ | $-6.09366+1.46931I$ | $-10.87065-3.08473I$ |
| $u=-0.718175-0.689913I$<br>$a=-1.05848-2.42146I$<br>$b=-1.151560+0.346723I$<br>$c=\ 1.44273+0.85052I$<br>$d=\ 0.779906-0.302096I$ | $-6.09366+1.46931I$ | $-10.87065-3.08473I$ |
| $u=-0.257524+0.984493I$<br>$a=\ 0.578727-0.253722I$<br>$b=\ 0.449354+0.635417I$<br>$c=-0.0473997-0.0121555I$<br>$d=-1.051440-0.287772I$ | $1.60581-0.49664I$ | $0.272784+1.115032I$ |
| $u=-0.257524+0.984493I$<br>$a=\ 0.498072+0.137191I$<br>$b=\ 0.866155-0.514022I$<br>$c=\ 0.017878+0.930985I$<br>$d=\ 0.15505+1.83052I$ | $1.60581-0.49664I$ | $0.272784+1.115032I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.257524-0.984493I$<br>$a=\ \ 0.578727+0.253722I$<br>$b=\ \ 0.449354-0.635417I$<br>$c=-0.0473997+0.0121555I$<br>$d=-1.051440+0.287772I$ | $1.60581+0.49664I$ | $0.272784-1.115032I$ |
| $u=-0.257524-0.984493I$<br>$a=\ \ 0.498072-0.137191I$<br>$b=\ \ 0.866155+0.514022I$<br>$c=\ \ 0.017878-0.930985I$<br>$d=\ \ 0.15505-1.83052I$ | $1.60581+0.49664I$ | $0.272784-1.115032I$ |
| $u=-0.924425+0.450549I$<br>$a=\ \ 0.733764-0.695514I$<br>$b=-0.282136+0.680443I$<br>$c=\ \ 2.44374-0.86916I$<br>$d=-0.05679+1.53145I$ | $-0.88516-3.95746I$ | $-1.72480+4.57056I$ |
| $u=-0.924425+0.450549I$<br>$a=\ \ 0.434246+0.040729I$<br>$b=\ \ 1.282760-0.214107I$<br>$c=-1.063930+0.292390I$<br>$d=-0.442706-0.285409I$ | $-0.88516-3.95746I$ | $-1.72480+4.57056I$ |
| $u=-0.924425-0.450549I$<br>$a=\ \ 0.733764+0.695514I$<br>$b=-0.282136-0.680443I$<br>$c=\ \ 2.44374+0.86916I$<br>$d=-0.05679-1.53145I$ | $-0.88516+3.95746I$ | $-1.72480-4.57056I$ |
| $u=-0.924425-0.450549I$<br>$a=\ \ 0.434246-0.040729I$<br>$b=\ \ 1.282760+0.214107I$<br>$c=-1.063930-0.292390I$<br>$d=-0.442706+0.285409I$ | $-0.88516+3.95746I$ | $-1.72480-4.57056I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.531079 + 0.883531I$<br>$a = 0.622511 + 0.357737I$<br>$b = 0.207598 - 0.693967I$<br>$c = -0.558583 - 0.645103I$<br>$d = -0.214583 - 0.739308I$ | $-2.26472 - 1.90334I$ | $-6.18021 + 1.07076I$ |
| $u = 0.531079 + 0.883531I$<br>$a = 0.465715 - 0.099917I$<br>$b = 1.052750 + 0.440407I$<br>$c = 0.451533 + 1.059860I$<br>$d = 1.21258 + 1.38512I$ | $-2.26472 - 1.90334I$ | $-6.18021 + 1.07076I$ |
| $u = 0.531079 - 0.883531I$<br>$a = 0.622511 - 0.357737I$<br>$b = 0.207598 + 0.693967I$<br>$c = -0.558583 + 0.645103I$<br>$d = -0.214583 + 0.739308I$ | $-2.26472 + 1.90334I$ | $-6.18021 - 1.07076I$ |
| $u = 0.531079 - 0.883531I$<br>$a = 0.465715 + 0.099917I$<br>$b = 1.052750 - 0.440407I$<br>$c = 0.451533 - 1.059860I$<br>$d = 1.21258 - 1.38512I$ | $-2.26472 + 1.90334I$ | $-6.18021 - 1.07076I$ |
| $u = -0.860778 + 0.429023I$<br>$a = 0.789089 - 0.671236I$<br>$b = -0.264746 + 0.625441I$<br>$c = 0.320925 - 0.473124I$<br>$d = 0.139948 - 1.119540I$ | $-1.135440 + 0.390890I$ | $-2.15175 + 1.14697I$ |
| $u = -0.860778 + 0.429023I$<br>$a = 0.07205 + 2.35819I$<br>$b = -0.987057 - 0.423659I$<br>$c = -0.954913 + 0.311920I$<br>$d = -0.508328 - 0.109971I$ | $-1.135440 + 0.390890I$ | $-2.15175 + 1.14697I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.860778 - 0.429023I$<br>$a = 0.789089 + 0.671236I$<br>$b = -0.264746 - 0.625441I$<br>$c = 0.320925 + 0.473124I$<br>$d = 0.139948 + 1.119540I$ | $-1.135440 - 0.390890I$ | $-2.15175 - 1.14697I$ |
| $u = -0.860778 - 0.429023I$<br>$a = 0.07205 - 2.35819I$<br>$b = -0.987057 + 0.423659I$<br>$c = -0.954913 - 0.311920I$<br>$d = -0.508328 + 0.109971I$ | $-1.135440 - 0.390890I$ | $-2.15175 - 1.14697I$ |
| $u = 0.959864 + 0.423605I$<br>$a = 0.431319 - 0.037774I$<br>$b = 1.300820 + 0.201498I$<br>$c = -0.436644 - 0.188137I$<br>$d = -0.003550 - 0.813354I$ | $-0.93346 + 1.43399I$ | $-1.64648 - 2.88902I$ |
| $u = 0.959864 + 0.423605I$<br>$a = 0.07049 - 2.03730I$<br>$b = -0.983037 + 0.490258I$<br>$c = -2.57502 - 0.87790I$<br>$d = 0.26331 + 1.68900I$ | $-0.93346 + 1.43399I$ | $-1.64648 - 2.88902I$ |
| $u = 0.959864 - 0.423605I$<br>$a = 0.431319 + 0.037774I$<br>$b = 1.300820 - 0.201498I$<br>$c = -0.436644 + 0.188137I$<br>$d = -0.003550 + 0.813354I$ | $-0.93346 - 1.43399I$ | $-1.64648 + 2.88902I$ |
| $u = 0.959864 - 0.423605I$<br>$a = 0.07049 + 2.03730I$<br>$b = -0.983037 - 0.490258I$<br>$c = -2.57502 + 0.87790I$<br>$d = 0.26331 - 1.68900I$ | $-0.93346 - 1.43399I$ | $-1.64648 + 2.88902I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.590924 + 0.743055I$ | | |
| $a = 0.464137 - 0.079085I$ | | |
| $b = 1.093750 + 0.356756I$ | $-4.63851 - 3.34557I$ | $-8.53398 + 2.94107I$ |
| $c = -0.73068 - 1.75542I$ | | |
| $d = -2.09697 - 2.99942I$ | | |
| $u = 0.590924 + 0.743055I$ | | |
| $a = -1.64730 - 2.48133I$ | | |
| $b = -1.185700 + 0.279725I$ | $-4.63851 - 3.34557I$ | $-8.53398 + 2.94107I$ |
| $c = -1.063010 - 0.587695I$ | | |
| $d = -0.450613 - 0.143094I$ | | |
| $u = 0.590924 - 0.743055I$ | | |
| $a = 0.464137 + 0.079085I$ | | |
| $b = 1.093750 - 0.356756I$ | $-4.63851 + 3.34557I$ | $-8.53398 - 2.94107I$ |
| $c = -0.73068 + 1.75542I$ | | |
| $d = -2.09697 + 2.99942I$ | | |
| $u = 0.590924 - 0.743055I$ | | |
| $a = -1.64730 + 2.48133I$ | | |
| $b = -1.185700 - 0.279725I$ | $-4.63851 + 3.34557I$ | $-8.53398 - 2.94107I$ |
| $c = -1.063010 + 0.587695I$ | | |
| $d = -0.450613 + 0.143094I$ | | |
| $u = -0.944268 + 0.080074I$ | | |
| $a = 0.90488 - 1.15379I$ | | |
| $b = -0.579133 + 0.536637I$ | $0.25240 + 2.75914I$ | $1.19764 - 4.35912I$ |
| $c = 2.95149 - 0.14973I$ | | |
| $d = -1.41848 + 0.38074I$ | | |
| $u = -0.944268 + 0.080074I$ | | |
| $a = 0.434964 + 0.007055I$ | | |
| $b = 1.298440 - 0.037280I$ | $0.25240 + 2.75914I$ | $1.19764 - 4.35912I$ |
| $c = -0.661782 - 0.078108I$ | | |
| $d = -0.169418 + 0.540287I$ | | |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.944268-0.080074I$ | | |
| $a=\ \ 0.90488+1.15379I$ | | |
| $b=-0.579133-0.536637I$ | $0.25240-2.75914I$ | $1.19764+4.35912I$ |
| $c=\ \ 2.95149+0.14973I$ | | |
| $d=-1.41848-0.38074I$ | | |
| $u=-0.944268-0.080074I$ | | |
| $a=\ \ 0.434964-0.007055I$ | | |
| $b=\ \ 1.298440+0.037280I$ | $0.25240-2.75914I$ | $1.19764+4.35912I$ |
| $c=-0.661782+0.078108I$ | | |
| $d=-0.169418-0.540287I$ | | |
| $u=\ \ 0.932230+0.544110I$ | | |
| $a=\ \ 0.681744+0.643239I$ | | |
| $b=-0.223996-0.732175I$ | $-2.05024+4.86305I$ | $-4.53119-6.13263I$ |
| $c=-0.757090-0.432327I$ | | |
| $d=-0.505611-0.637960I$ | | |
| $u=\ \ 0.932230+0.544110I$ | | |
| $a=-0.26957-2.08849I$ | | |
| $b=-1.060790+0.470969I$ | $-2.05024+4.86305I$ | $-4.53119-6.13263I$ |
| $c=\ \ 1.152600+0.439830I$ | | |
| $d=\ \ 0.702756-0.492106I$ | | |
| $u=\ \ 0.932230-0.544110I$ | | |
| $a=\ \ 0.681744-0.643239I$ | | |
| $b=-0.223996+0.732175I$ | $-2.05024-4.86305I$ | $-4.53119+6.13263I$ |
| $c=-0.757090+0.432327I$ | | |
| $d=-0.505611+0.637960I$ | | |
| $u=\ \ 0.932230-0.544110I$ | | |
| $a=-0.26957+2.08849I$ | | |
| $b=-1.060790-0.470969I$ | $-2.05024-4.86305I$ | $-4.53119+6.13263I$ |
| $c=\ \ 1.152600-0.439830I$ | | |
| $d=\ \ 0.702756+0.492106I$ | | |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.708662 + 0.534244I$ | | |
| $a = 0.787028 + 0.513024I$ | | |
| $b = -0.108292 - 0.581260I$ | $-2.72088 - 0.47986I$ | $-5.93461 - 0.48126I$ |
| $c = -1.83838 - 0.54055I$ | | |
| $d = -0.277411 + 0.604173I$ | | |
| $u = 0.708662 + 0.534244I$ | | |
| $a = 0.454757 - 0.052031I$ | | |
| $b = 1.170560 + 0.248344I$ | $-2.72088 - 0.47986I$ | $-5.93461 - 0.48126I$ |
| $c = 0.790083 + 0.534557I$ | | |
| $d = 0.815520 + 0.154915I$ | | |
| $u = 0.708662 - 0.534244I$ | | |
| $a = 0.787028 - 0.513024I$ | | |
| $b = -0.108292 + 0.581260I$ | $-2.72088 + 0.47986I$ | $-5.93461 + 0.48126I$ |
| $c = -1.83838 + 0.54055I$ | | |
| $d = -0.277411 - 0.604173I$ | | |
| $u = 0.708662 - 0.534244I$ | | |
| $a = 0.454757 + 0.052031I$ | | |
| $b = 1.170560 - 0.248344I$ | $-2.72088 + 0.47986I$ | $-5.93461 + 0.48126I$ |
| $c = 0.790083 - 0.534557I$ | | |
| $d = 0.815520 - 0.154915I$ | | |
| $u = -0.947945 + 0.635897I$ | | |
| $a = 0.428626 + 0.057689I$ | | |
| $b = 1.291520 - 0.308415I$ | $-5.38662 - 3.65224I$ | $-8.95361 + 3.74887I$ |
| $c = 1.067620 - 0.525455I$ | | |
| $d = 0.956024 - 0.254994I$ | | |
| $u = -0.947945 + 0.635897I$ | | |
| $a = -0.48016 + 1.96758I$ | | |
| $b = -1.117060 - 0.479673I$ | $-5.38662 - 3.65224I$ | $-8.95361 + 3.74887I$ |
| $c = 2.07459 - 1.34946I$ | | |
| $d = 1.14302 + 1.63054I$ | | |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.947945-0.635897I$<br>$a=\ 0.428626-0.057689I$<br>$b=\ 1.291520+0.308415I$<br>$c=\ 1.067620+0.525455I$<br>$d=\ 0.956024+0.254994I$ | $-5.38662+3.65224I$ | $-8.95361-3.74887I$ |
| $u=-0.947945-0.635897I$<br>$a=-0.48016-1.96758I$<br>$b=-1.117060+0.479673I$<br>$c=\ 2.07459+1.34946I$<br>$d=\ 1.14302-1.63054I$ | $-5.38662+3.65224I$ | $-8.95361-3.74887I$ |
| $u=-0.538756+1.020250I$<br>$a=\ 0.569371-0.352320I$<br>$b=\ 0.270030+0.785880I$<br>$c=\ 0.149966-0.863957I$<br>$d=\ 0.01588-1.54419I$ | $-0.15070+6.61979I$ | $-2.54938-5.39938I$ |
| $u=-0.538756+1.020250I$<br>$a=\ 0.455847+0.116484I$<br>$b=\ 1.059250-0.526209I$<br>$c=-0.353472+1.309410I$<br>$d=-1.51255+2.14943I$ | $-0.15070+6.61979I$ | $-2.54938-5.39938I$ |
| $u=-0.538756-1.020250I$<br>$a=\ 0.569371+0.352320I$<br>$b=\ 0.270030-0.785880I$<br>$c=\ 0.149966+0.863957I$<br>$d=\ 0.01588+1.54419I$ | $-0.15070-6.61979I$ | $-2.54938+5.39938I$ |
| $u=-0.538756-1.020250I$<br>$a=\ 0.455847-0.116484I$<br>$b=\ 1.059250+0.526209I$<br>$c=-0.353472-1.309410I$<br>$d=-1.51255-2.14943I$ | $-0.15070-6.61979I$ | $-2.54938+5.39938I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-1.20232$<br>$a=\ \ 0.485197+1.199570I$<br>$b=-0.710226-0.716423I$<br>$c=-0.601344-0.627663I$<br>$d=\ \ 0.275293+1.126070I$ | $4.04432$ | $-0.509520$ |
| $u=-1.20232$<br>$a=\ \ 0.485197-1.199570I$<br>$b=-0.710226+0.716423I$<br>$c=-0.601344+0.627663I$<br>$d=\ \ 0.275293-1.126070I$ | $4.04432$ | $-0.509520$ |
| $u=\ \ 1.034470+0.639555I$<br>$a=\ \ 0.420652-0.055969I$<br>$b=\ \ 1.335910+0.310802I$<br>$c=-1.216440-0.247352I$<br>$d=-0.572842+0.270664I$ | $-3.29566+8.62980I$ | $-5.39171-7.80256I$ |
| $u=\ \ 1.034470+0.639555I$<br>$a=-0.40860-1.78861I$<br>$b=-1.121390+0.531363I$<br>$c=-2.28382-1.57837I$<br>$d=-1.32289+2.33789I$ | $-3.29566+8.62980I$ | $-5.39171-7.80256I$ |
| $u=\ \ 1.034470-0.639555I$<br>$a=\ \ 0.420652+0.055969I$<br>$b=\ \ 1.335910-0.310802I$<br>$c=-1.216440+0.247352I$<br>$d=-0.572842-0.270664I$ | $-3.29566-8.62980I$ | $-5.39171+7.80256I$ |
| $u=\ \ 1.034470-0.639555I$<br>$a=-0.40860+1.78861I$<br>$b=-1.121390-0.531363I$<br>$c=-2.28382+1.57837I$<br>$d=-1.32289-2.33789I$ | $-3.29566-8.62980I$ | $-5.39171+7.80256I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.106900 + 0.677869I$ | | |
| $a = 0.547401 + 0.638144I$ | | |
| $b = -0.225605 - 0.902768I$ | $-0.49001 + 7.69321I$ | $-4.38087 - 4.90752I$ |
| $c = -1.46124 - 0.05347I$ | | |
| $d = -0.301873 + 0.919404I$ | | |
| $u = 1.106900 + 0.677869I$ | | |
| $a = -0.42127 - 1.63805I$ | | |
| $b = -1.147260 + 0.572609I$ | $-0.49001 + 7.69321I$ | $-4.38087 - 4.90752I$ |
| $c = 1.63336 + 0.56943I$ | | |
| $d = 0.89907 - 1.74265I$ | | |
| $u = 1.106900 - 0.677869I$ | | |
| $a = 0.547401 - 0.638144I$ | | |
| $b = -0.225605 + 0.902768I$ | $-0.49001 - 7.69321I$ | $-4.38087 + 4.90752I$ |
| $c = -1.46124 + 0.05347I$ | | |
| $d = -0.301873 - 0.919404I$ | | |
| $u = 1.106900 - 0.677869I$ | | |
| $a = -0.42127 + 1.63805I$ | | |
| $b = -1.147260 - 0.572609I$ | $-0.49001 - 7.69321I$ | $-4.38087 + 4.90752I$ |
| $c = 1.63336 - 0.56943I$ | | |
| $d = 0.89907 + 1.74265I$ | | |
| $u = -1.174770 + 0.565730I$ | | |
| $a = 0.538852 - 0.710226I$ | | |
| $b = -0.322013 + 0.893610I$ | $4.51708 - 4.93169I$ | $1.83206 + 3.23906I$ |
| $c = 1.147710 + 0.342848I$ | | |
| $d = -0.624036 + 0.312274I$ | | |
| $u = -1.174770 + 0.565730I$ | | |
| $a = -0.21563 + 1.58331I$ | | |
| $b = -1.084450 - 0.620088I$ | $4.51708 - 4.93169I$ | $1.83206 + 3.23906I$ |
| $c = -1.66173 + 0.22732I$ | | |
| $d = 0.08624 - 1.59356I$ | | |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-1.174770-0.565730I$<br>$a=\ \ 0.538852+0.710226I$<br>$b=-0.322013-0.893610I$<br>$c=\ \ 1.147710-0.342848I$<br>$d=-0.624036-0.312274I$ | $4.51708+4.93169I$ | $1.83206-3.23906I$ |
| $u=-1.174770-0.565730I$<br>$a=-0.21563-1.58331I$<br>$b=-1.084450+0.620088I$<br>$c=-1.66173-0.22732I$<br>$d=\ \ 0.08624+1.59356I$ | $4.51708+4.93169I$ | $1.83206-3.23906I$ |
| $u=\ \ 1.307610+0.109024I$<br>$a=\ \ 0.431895+1.046090I$<br>$b=-0.662804-0.816722I$<br>$c=\ \ 0.341826+0.976264I$<br>$d=\ \ 0.01297-1.72150I$ | $7.49754+4.17106I$ | $3.10533-3.69910I$ |
| $u=\ \ 1.307610+0.109024I$<br>$a=\ \ 0.309103-1.229950I$<br>$b=-0.807809+0.764743I$<br>$c=\ \ 0.970909-0.812558I$<br>$d=-1.01374+1.12698I$ | $7.49754+4.17106I$ | $3.10533-3.69910I$ |
| $u=\ \ 1.307610-0.109024I$<br>$a=\ \ 0.431895-1.046090I$<br>$b=-0.662804+0.816722I$<br>$c=\ \ 0.341826-0.976264I$<br>$d=\ \ 0.01297+1.72150I$ | $7.49754-4.17106I$ | $3.10533+3.69910I$ |
| $u=\ \ 1.307610-0.109024I$<br>$a=\ \ 0.309103+1.229950I$<br>$b=-0.807809-0.764743I$<br>$c=\ \ 0.970909+0.812558I$<br>$d=-1.01374-1.12698I$ | $7.49754-4.17106I$ | $3.10533+3.69910I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-1.155970+0.720501I$<br>$a=\ \ 0.515710-0.630924I$<br>$b=-0.223354+0.950156I$<br>$c=\ \ 1.69519+0.06105I$<br>$d=\ \ 0.11817+1.56166I$ | $1.81705-12.92960I$ | $-1.59130+8.57718I$ |
| $u=-1.155970+0.720501I$<br>$a=-0.44919+1.53889I$<br>$b=-1.174790-0.598801I$<br>$c=-1.79988+0.62913I$<br>$d=-1.01052-2.28746I$ | $1.81705-12.92960I$ | $-1.59130+8.57718I$ |
| $u=-1.155970-0.720501I$<br>$a=\ \ 0.515710+0.630924I$<br>$b=-0.223354-0.950156I$<br>$c=\ \ 1.69519-0.06105I$<br>$d=\ \ 0.11817-1.56166I$ | $1.81705+12.92960I$ | $-1.59130-8.57718I$ |
| $u=-1.155970-0.720501I$<br>$a=-0.44919-1.53889I$<br>$b=-1.174790+0.598801I$<br>$c=-1.79988-0.62913I$<br>$d=-1.01052+2.28746I$ | $1.81705+12.92960I$ | $-1.59130-8.57718I$ |
| $u=\ \ 0.620359$<br>$a=\ \ 0.464106$<br>$b=\ \ 1.15468$<br>$c=\ \ 0.718830$<br>$d=\ \ 0.969102$ | $-2.31973$ | $-2.07640$ |
| $u=\ \ 0.620359$<br>$a=\ \ 2.33497$<br>$b=-0.571729$<br>$c=-2.68843$<br>$d=\ \ 0.495424$ | $-2.31973$ | $-2.07640$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.141853 + 0.491513I$ | | |
| $a = 0.529029 - 0.029302I$ | | |
| $b = 0.884474 + 0.104376I$ | $-2.95645 + 1.74546I$ | $-9.67431 - 3.49934I$ |
| $c = 0.26786 - 2.67120I$ | | |
| $d = 0.38957 - 5.63026I$ | | |
| $u = 0.141853 + 0.491513I$ | | |
| $a = -7.80514 - 4.14749I$ | | |
| $b = -1.099910 + 0.053090I$ | $-2.95645 + 1.74546I$ | $-9.67431 - 3.49934I$ |
| $c = -0.694116 + 1.199210I$ | | |
| $d = 0.084276 + 0.212896I$ | | |
| $u = 0.141853 - 0.491513I$ | | |
| $a = 0.529029 + 0.029302I$ | | |
| $b = 0.884474 - 0.104376I$ | $-2.95645 - 1.74546I$ | $-9.67431 + 3.49934I$ |
| $c = 0.26786 + 2.67120I$ | | |
| $d = 0.38957 + 5.63026I$ | | |
| $u = 0.141853 - 0.491513I$ | | |
| $a = -7.80514 + 4.14749I$ | | |
| $b = -1.099910 - 0.053090I$ | $-2.95645 - 1.74546I$ | $-9.67431 + 3.49934I$ |
| $c = -0.694116 - 1.199210I$ | | |
| $d = 0.084276 - 0.212896I$ | | |

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

**(i) Arc colorings**

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

$$a_8 = \begin{pmatrix} v \\ 0 \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

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

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

$$a_1 = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$

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

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

$$a_{10} = \begin{pmatrix} v \\ 0 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} v \\ 0 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} v-1 \\ 1 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -4v - 1$

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

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

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

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

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

| | Solutions to $I_1^v$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|---|
| $v=$ | $0.500000+0.866025I$ | | |
| $a=$ | 0 | | |
| $b=$ | 1.00000 | $-1.64493+2.02988I$ | $-3.00000-3.46410I$ |
| $c=$ | $0.500000+0.866025I$ | | |
| $d=$ | 0 | | |
| $v=$ | $0.500000-0.866025I$ | | |
| $a=$ | 0 | | |
| $b=$ | 1.00000 | $-1.64493-2.02988I$ | $-3.00000+3.46410I$ |
| $c=$ | $0.500000-0.866025I$ | | |
| $d=$ | 0 | | |

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

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= 4v - 5$

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

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

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

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

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

| | Solutions to $I_2^v$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|---|
| $v=$ | $0.500000+0.866025I$ | | |
| $a=$ | 1.00000 | | |
| $b=$ | 0 | $-1.64493-2.02988I$ | $-3.00000+3.46410I$ |
| $c=$ | 0 | | |
| $d=$ | $0.500000-0.866025I$ | | |
| $v=$ | $0.500000-0.866025I$ | | |
| $a=$ | 1.00000 | | |
| $b=$ | 0 | $-1.64493+2.02988I$ | $-3.00000-3.46410I$ |
| $c=$ | 0 | | |
| $d=$ | $0.500000+0.866025I$ | | |

### V. $I_3^v = \langle a,\ d+1,\ c+a,\ b-1,\ v+1 \rangle$

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= -12$

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

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

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

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

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

| Solutions to $I_3^v$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $v = -1.00000$ | | |
| $a = 0$ | | |
| $b = 1.00000$ | $-3.28987$ | $-12.0000$ |
| $c = 0$ | | |
| $d = -1.00000$ | | |

## VI.

$$\boldsymbol{I_4^v = \langle a,\ c^2v + cv + \cdots - 2ca - a,\ dv - 1,\ c^2v^2 + v^2c + \cdots + a^2 - av,\ b - 1\rangle}$$

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= -d^2 - v^2 + 4c - 8$

**(iv) u-Polynomials at the component** : It cannot be defined for a positive dimension component.

**(v) Riley Polynomials at the component** : It cannot be defined for a positive dimension component.

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

| Solution to $I_4^v$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $v=\cdots$ | | |
| $a=\cdots$ | | |
| $b=\cdots$ | $-3.28987-2.02988I$ | $-12.31897+3.83889I$ |
| $c=\cdots$ | | |
| $d=\cdots$ | | |

## VII. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^2(u-1)^3(u^{46}+21u^{45}+\cdots-4u+1)$ |
| $c_2, c_7$ | $u^2(u-1)^3(u^{46}-5u^{45}+\cdots-2u+1)$ |
| $c_3, c_8$ | $u^5(u^{46}+3u^{45}+\cdots+32u+32)$ |
| $c_4, c_9$ | $u^2(u+1)^3(u^{46}-5u^{45}+\cdots-2u+1)$ |
| $c_5$ | $u(u^2-u+1)(u^2+u+1)(u^{46}+u^{45}+\cdots+2596u+1252)$ |
| $c_6, c_{12}$ | $u(u^2-u+1)(u^2+u+1)(u^{46}-u^{45}+\cdots+4u+4)$ |
| $c_{10}$ | $u^2(u+1)^3(u^{46}+21u^{45}+\cdots-4u+1)$ |
| $c_{11}$ | $u(u^2+u+1)^2(u^{46}-21u^{45}+\cdots+40u+16)$ |

## VIII. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_{10}$ | $y^2(y-1)^3(y^{46}+19y^{45}+\cdots-72y+1)$ |
| $c_2, c_4, c_7$ $c_9$ | $y^2(y-1)^3(y^{46}-21y^{45}+\cdots+4y+1)$ |
| $c_3, c_8$ | $y^5(y^{46}-15y^{45}+\cdots+4096y+1024)$ |
| $c_5$ | $y(y^2+y+1)^2(y^{46}-3y^{45}+\cdots-2.04086\times10^7y+1567504)$ |
| $c_6, c_{12}$ | $y(y^2+y+1)^2(y^{46}+21y^{45}+\cdots-40y+16)$ |
| $c_{11}$ | $y(y^2+y+1)^2(y^{46}+9y^{45}+\cdots-5664y+256)$ |