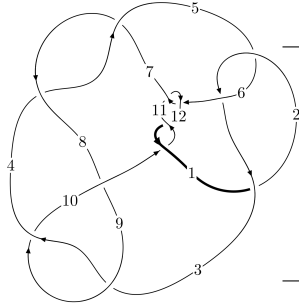
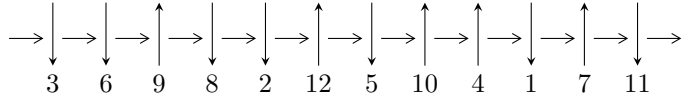


12a<sub>0357</sub> (K12a<sub>0357</sub>)



A knot diagram<sup>1</sup>

**Linearized knot diagram**



**Solving Sequence**

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

**Ideals for irreducible components<sup>2</sup> of  $X_{\text{par}}$**

$$I_1^u = \langle 1.53983 \times 10^{51} u^{99} + 4.05833 \times 10^{51} u^{98} + \dots + 2.11035 \times 10^{51} b - 1.02725 \times 10^{52},$$

$$- 1.15475 \times 10^{51} u^{99} - 3.57142 \times 10^{51} u^{98} + \dots + 2.11035 \times 10^{51} a + 1.63343 \times 10^{52}, u^{100} + u^{99} + \dots - 4u +$$

$$I_2^u = \langle u^3 + 2b + 2a - 2u, -2u^3 a + 2u^2 a - u^3 + 2a^2 + u^2 - 2a + 2u - 4, u^4 - 2u^2 + 2 \rangle$$

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

\* 3 irreducible components of  $\dim_{\mathbb{C}} = 0$ , with total 110 representations.

<sup>1</sup>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>).

<sup>2</sup>All coefficients of polynomials are rational numbers. But the coefficients are sometimes approximated in decimal forms when there is not enough margin.

**I.**

$$I_1^u = \langle 1.54 \times 10^{51} u^{99} + 4.06 \times 10^{51} u^{98} + \dots + 2.11 \times 10^{51} b - 1.03 \times 10^{52}, -1.15 \times 10^{51} u^{99} - 3.57 \times 10^{51} u^{98} + \dots + 2.11 \times 10^{51} a + 1.63 \times 10^{52}, u^{100} + u^{99} + \dots - 4u + 4 \rangle$$

**(i) Arc colorings**

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

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

$$a_1 = \begin{pmatrix} 0.547186u^{99} + 1.69233u^{98} + \dots + 4.11499u - 7.74008 \\ -0.729657u^{99} - 1.92306u^{98} + \dots + 4.44039u + 4.86768 \end{pmatrix}$$

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

$$a_{11} = \begin{pmatrix} -1.79863u^{99} + 1.22296u^{98} + \dots + 1.87484u - 7.99017 \\ 1.88775u^{99} - 1.11746u^{98} + \dots - 10.4758u + 12.6756 \end{pmatrix}$$

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

$$a_2 = \begin{pmatrix} 0.178071u^{99} + 1.82811u^{98} + \dots + 3.57812u - 7.93309 \\ -0.360542u^{99} - 2.05883u^{98} + \dots + 4.97727u + 5.06069 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -u^2 + 1 \\ u^4 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} -u^5 + 2u^3 - u \\ u^7 - u^5 + u \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 1.21054u^{99} + 0.764246u^{98} + \dots - 22.5600u + 8.32879 \\ -0.674548u^{99} - 2.17762u^{98} + \dots + 14.7440u - 0.641411 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -u^8 + 3u^6 - 3u^4 + 1 \\ u^{10} - 2u^8 + u^6 + 2u^4 - u^2 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} -1.59623u^{99} + 0.969406u^{98} + \dots + 3.93582u - 7.28650 \\ 1.46440u^{99} - 1.22984u^{98} + \dots - 9.77743u + 11.7646 \end{pmatrix}$$

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

**(iii) Cusp Shapes =  $-0.789187u^{99} - 6.38881u^{98} + \dots - 5.66830u + 22.0670$**

(iv) u-Polynomials at the component

| Crossings        | u-Polynomials at each crossing             |
|------------------|--|
| $c_1$            | $u^{100} + 45u^{99} + \cdots + 75u + 1$    |
| $c_2, c_5$       | $u^{100} + 3u^{99} + \cdots - 17u + 1$     |
| $c_3, c_9$       | $u^{100} - u^{99} + \cdots + 4u + 4$       |
| $c_4, c_7$       | $u^{100} - 3u^{99} + \cdots + 3612u + 748$ |
| $c_6, c_{11}$    | $u^{100} - 2u^{99} + \cdots + 12u + 5$     |
| $c_8$            | $u^{100} - 55u^{99} + \cdots - 80u + 16$   |
| $c_{10}, c_{12}$ | $u^{100} + 32u^{99} + \cdots + 46u + 25$   |

(v) Riley Polynomials at the component

| Crossings        | Riley Polynomials at each crossing                |
|------------------|---|
| $c_1$            | $y^{100} + 35y^{99} + \dots - 3619y + 1$          |
| $c_2, c_5$       | $y^{100} - 45y^{99} + \dots - 75y + 1$            |
| $c_3, c_9$       | $y^{100} - 55y^{99} + \dots - 80y + 16$           |
| $c_4, c_7$       | $y^{100} + 85y^{99} + \dots - 21196752y + 559504$ |
| $c_6, c_{11}$    | $y^{100} + 32y^{99} + \dots + 46y + 25$           |
| $c_8$            | $y^{100} - 15y^{99} + \dots - 5376y + 256$        |
| $c_{10}, c_{12}$ | $y^{100} + 80y^{99} + \dots + 107034y + 625$      |

(vi) Complex Volumes and Cusp Shapes

| Solutions to $I_1^u$   | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape           |
|--|---------------------------------------|----------------------|
| $u = 0.912469 + 0.405577I$<br>$a = 1.019230 + 0.409473I$<br>$b = -0.55692 - 1.37489I$    | $-0.20776 + 3.79756I$                 | 0                    |
| $u = 0.912469 - 0.405577I$<br>$a = 1.019230 - 0.409473I$<br>$b = -0.55692 + 1.37489I$    | $-0.20776 - 3.79756I$                 | 0                    |
| $u = -0.841778 + 0.519872I$<br>$a = -2.00523 + 0.30647I$<br>$b = 1.66830 - 1.62048I$     | $-4.20715 - 5.65114I$                 | 0                    |
| $u = -0.841778 - 0.519872I$<br>$a = -2.00523 - 0.30647I$<br>$b = 1.66830 + 1.62048I$     | $-4.20715 + 5.65114I$                 | 0                    |
| $u = -0.909434 + 0.598251I$<br>$a = -2.21700 - 0.75018I$<br>$b = 2.31160 - 0.62141I$     | $1.14788 - 11.04990I$                 | 0                    |
| $u = -0.909434 - 0.598251I$<br>$a = -2.21700 + 0.75018I$<br>$b = 2.31160 + 0.62141I$     | $1.14788 + 11.04990I$                 | 0                    |
| $u = -0.892846 + 0.148332I$<br>$a = 0.874246 - 0.052986I$<br>$b = -0.880061 + 0.446449I$ | $1.50372 - 0.38043I$                  | $6.35087 + 0.58790I$ |
| $u = -0.892846 - 0.148332I$<br>$a = 0.874246 + 0.052986I$<br>$b = -0.880061 - 0.446449I$ | $1.50372 + 0.38043I$                  | $6.35087 - 0.58790I$ |
| $u = 0.934036 + 0.577393I$<br>$a = 1.83094 - 0.79317I$<br>$b = -1.93636 - 0.41442I$      | $1.95982 + 5.33714I$                  | 0                    |
| $u = 0.934036 - 0.577393I$<br>$a = 1.83094 + 0.79317I$<br>$b = -1.93636 + 0.41442I$      | $1.95982 - 5.33714I$                  | 0                    |

| Solutions to $I_1^u$   | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape            |
|--|---------------------------------------|-----------------------|
| $u = -0.814912 + 0.386226I$<br>$a = -2.91863 + 1.07511I$<br>$b = 1.36240 - 1.22807I$     | $-1.73172 - 3.82124I$                 | $-3.99607 + 6.81813I$ |
| $u = -0.814912 - 0.386226I$<br>$a = -2.91863 - 1.07511I$<br>$b = 1.36240 + 1.22807I$     | $-1.73172 + 3.82124I$                 | $-3.99607 - 6.81813I$ |
| $u = -0.610558 + 0.655440I$<br>$a = -0.29458 + 1.91836I$<br>$b = -1.14490 - 1.51664I$    | $0.28832 + 6.20529I$                  | $-3.10468 - 4.98772I$ |
| $u = -0.610558 - 0.655440I$<br>$a = -0.29458 - 1.91836I$<br>$b = -1.14490 + 1.51664I$    | $0.28832 - 6.20529I$                  | $-3.10468 + 4.98772I$ |
| $u = -1.055440 + 0.366629I$<br>$a = 1.177940 - 0.074014I$<br>$b = -1.014110 + 0.235891I$ | $3.00378 - 1.28109I$                  | 0                     |
| $u = -1.055440 - 0.366629I$<br>$a = 1.177940 + 0.074014I$<br>$b = -1.014110 - 0.235891I$ | $3.00378 + 1.28109I$                  | 0                     |
| $u = 0.763559 + 0.437417I$<br>$a = -1.122190 - 0.545518I$<br>$b = 0.871896 + 0.806261I$  | $-1.57401 + 1.88920I$                 | $-4.68601 - 4.44810I$ |
| $u = 0.763559 - 0.437417I$<br>$a = -1.122190 + 0.545518I$<br>$b = 0.871896 - 0.806261I$  | $-1.57401 - 1.88920I$                 | $-4.68601 + 4.44810I$ |
| $u = 0.984201 + 0.538389I$<br>$a = -1.63348 + 0.33461I$<br>$b = 1.78287 + 0.23609I$      | $2.74500 + 6.04482I$                  | 0                     |
| $u = 0.984201 - 0.538389I$<br>$a = -1.63348 - 0.33461I$<br>$b = 1.78287 - 0.23609I$      | $2.74500 - 6.04482I$                  | 0                     |

| Solutions to $I_1^u$   | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape             |
|--|---------------------------------------|------------------------|
| $u = -1.131300 + 0.031645I$<br>$a = 0.391679 - 0.793695I$<br>$b = -0.398613 - 0.311538I$ | $6.37271 + 0.11350I$                  | 0                      |
| $u = -1.131300 - 0.031645I$<br>$a = 0.391679 + 0.793695I$<br>$b = -0.398613 + 0.311538I$ | $6.37271 - 0.11350I$                  | 0                      |
| $u = -0.781213 + 0.377020I$<br>$a = -1.19190 + 1.27616I$<br>$b = 0.50457 - 2.37511I$     | $-1.84014 + 0.43513I$                 | $-4.52284 + 3.06310I$  |
| $u = -0.781213 - 0.377020I$<br>$a = -1.19190 - 1.27616I$<br>$b = 0.50457 + 2.37511I$     | $-1.84014 - 0.43513I$                 | $-4.52284 - 3.06310I$  |
| $u = -0.150097 + 0.854140I$<br>$a = -1.35989 + 0.76503I$<br>$b = -0.66687 - 1.38476I$    | $5.33031 + 11.95280I$                 | $-1.22194 - 7.32364I$  |
| $u = -0.150097 - 0.854140I$<br>$a = -1.35989 - 0.76503I$<br>$b = -0.66687 + 1.38476I$    | $5.33031 - 11.95280I$                 | $-1.22194 + 7.32364I$  |
| $u = 0.128935 + 0.855015I$<br>$a = 1.244510 + 0.598650I$<br>$b = 0.741965 - 1.096350I$   | $6.34419 - 5.84958I$                  | $0.46765 + 2.69584I$   |
| $u = 0.128935 - 0.855015I$<br>$a = 1.244510 - 0.598650I$<br>$b = 0.741965 + 1.096350I$   | $6.34419 + 5.84958I$                  | $0.46765 - 2.69584I$   |
| $u = -0.681105 + 0.527016I$<br>$a = -1.59641 + 1.60846I$<br>$b = 0.07953 - 1.62701I$     | $-4.66816 + 1.38516I$                 | $-10.24072 - 0.52045I$ |
| $u = -0.681105 - 0.527016I$<br>$a = -1.59641 - 1.60846I$<br>$b = 0.07953 + 1.62701I$     | $-4.66816 - 1.38516I$                 | $-10.24072 + 0.52045I$ |

| Solutions to $I_1^u$   | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape           |
|--|---------------------------------------|----------------------|
| $u = 0.097937 + 0.853235I$<br>$a = -0.842921 - 0.573169I$<br>$b = -0.359480 + 1.282810I$ | $7.38468 - 5.80677I$                  | $1.37130 + 3.23085I$ |
| $u = 0.097937 - 0.853235I$<br>$a = -0.842921 + 0.573169I$<br>$b = -0.359480 - 1.282810I$ | $7.38468 + 5.80677I$                  | $1.37130 - 3.23085I$ |
| $u = 0.564718 + 0.646983I$<br>$a = 0.12930 + 1.50881I$<br>$b = 1.12507 - 1.09493I$       | $0.901266 - 0.586971I$                | $-1.67720 + 0.I$     |
| $u = 0.564718 - 0.646983I$<br>$a = 0.12930 - 1.50881I$<br>$b = 1.12507 + 1.09493I$       | $0.901266 + 0.586971I$                | $-1.67720 + 0.I$     |
| $u = 1.139570 + 0.076692I$<br>$a = -0.102816 - 0.836460I$<br>$b = 0.238969 - 0.353591I$  | $6.08791 + 5.84929I$                  | 0                    |
| $u = 1.139570 - 0.076692I$<br>$a = -0.102816 + 0.836460I$<br>$b = 0.238969 + 0.353591I$  | $6.08791 - 5.84929I$                  | 0                    |
| $u = -0.069488 + 0.854881I$<br>$a = 0.807259 - 0.508489I$<br>$b = 0.524439 + 1.090280I$  | $7.98792 - 0.33942I$                  | $2.27380 + 1.86979I$ |
| $u = -0.069488 - 0.854881I$<br>$a = 0.807259 + 0.508489I$<br>$b = 0.524439 - 1.090280I$  | $7.98792 + 0.33942I$                  | $2.27380 - 1.86979I$ |
| $u = 1.085200 + 0.397109I$<br>$a = 0.720541 + 0.454709I$<br>$b = 0.019567 - 1.119010I$   | $0.18495 + 3.60808I$                  | 0                    |
| $u = 1.085200 - 0.397109I$<br>$a = 0.720541 - 0.454709I$<br>$b = 0.019567 + 1.119010I$   | $0.18495 - 3.60808I$                  | 0                    |



| Solutions to $I_1^u$  | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape            |
|---|---------------------------------------|-----------------------|
| $u = 0.793988 + 0.262883I$<br>$a = 2.82288 + 0.48559I$<br>$b = -1.208080 - 0.604939I$   | $-0.988788 - 0.952734I$               | $-0.15661 - 1.44604I$ |
| $u = 0.793988 - 0.262883I$<br>$a = 2.82288 - 0.48559I$<br>$b = -1.208080 + 0.604939I$   | $-0.988788 + 0.952734I$               | $-0.15661 + 1.44604I$ |
| $u = -1.041020 + 0.542940I$<br>$a = 1.36561 + 0.86394I$<br>$b = -1.81769 - 0.34870I$    | $2.88537 - 0.64653I$                  | 0                     |
| $u = -1.041020 - 0.542940I$<br>$a = 1.36561 - 0.86394I$<br>$b = -1.81769 + 0.34870I$    | $2.88537 + 0.64653I$                  | 0                     |
| $u = 1.083910 + 0.462365I$<br>$a = -0.918572 - 0.375609I$<br>$b = 0.937185 + 0.367758I$ | $2.44049 + 5.71324I$                  | 0                     |
| $u = 1.083910 - 0.462365I$<br>$a = -0.918572 + 0.375609I$<br>$b = 0.937185 - 0.367758I$ | $2.44049 - 5.71324I$                  | 0                     |
| $u = -0.426174 + 0.689734I$<br>$a = -0.33089 - 1.61078I$<br>$b = 1.140840 + 0.629451I$  | $1.09924 - 4.09171I$                  | $-1.69507 + 5.63411I$ |
| $u = -0.426174 - 0.689734I$<br>$a = -0.33089 + 1.61078I$<br>$b = 1.140840 - 0.629451I$  | $1.09924 + 4.09171I$                  | $-1.69507 - 5.63411I$ |
| $u = 0.807716 + 0.067600I$<br>$a = -0.749405 + 0.499425I$<br>$b = 1.29639 - 0.97122I$   | $-0.64641 + 2.78439I$                 | $1.21161 - 6.73563I$  |
| $u = 0.807716 - 0.067600I$<br>$a = -0.749405 - 0.499425I$<br>$b = 1.29639 + 0.97122I$   | $-0.64641 - 2.78439I$                 | $1.21161 + 6.73563I$  |

| Solutions to $I_1^u$   | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape              |
|--|---------------------------------------|-------------------------|
| $u = 0.475387 + 0.654531I$<br>$a = 0.03470 - 1.55956I$<br>$b = -0.770329 + 0.879847I$  | $1.27228 - 1.41798I$                  | $-1.021987 + 0.105675I$ |
| $u = 0.475387 - 0.654531I$<br>$a = 0.03470 + 1.55956I$<br>$b = -0.770329 - 0.879847I$  | $1.27228 + 1.41798I$                  | $-1.021987 - 0.105675I$ |
| $u = 0.050429 + 0.795903I$<br>$a = 1.255810 - 0.182945I$<br>$b = 0.201445 - 0.051960I$ | $2.95290 - 2.61250I$                  | $1.60904 + 3.16874I$    |
| $u = 0.050429 - 0.795903I$<br>$a = 1.255810 + 0.182945I$<br>$b = 0.201445 + 0.051960I$ | $2.95290 + 2.61250I$                  | $1.60904 - 3.16874I$    |
| $u = -0.119249 + 0.780742I$<br>$a = -1.72510 + 0.11892I$<br>$b = 0.152712 - 0.741542I$ | $-1.15099 + 5.81538I$                 | $-5.00175 - 6.04754I$   |
| $u = -0.119249 - 0.780742I$<br>$a = -1.72510 - 0.11892I$<br>$b = 0.152712 + 0.741542I$ | $-1.15099 - 5.81538I$                 | $-5.00175 + 6.04754I$   |
| $u = -1.127070 + 0.498863I$<br>$a = -0.02921 + 1.49604I$<br>$b = -1.00419 - 1.48775I$  | $-0.61092 - 3.91398I$                 | 0                       |
| $u = -1.127070 - 0.498863I$<br>$a = -0.02921 - 1.49604I$<br>$b = -1.00419 + 1.48775I$  | $-0.61092 + 3.91398I$                 | 0                       |
| $u = -0.028534 + 0.756569I$<br>$a = -0.125642 - 0.736579I$<br>$b = 0.20550 - 1.68728I$ | $0.52074 + 2.75335I$                  | $-1.11486 - 3.14721I$   |
| $u = -0.028534 - 0.756569I$<br>$a = -0.125642 + 0.736579I$<br>$b = 0.20550 + 1.68728I$ | $0.52074 - 2.75335I$                  | $-1.11486 + 3.14721I$   |

| Solutions to $I_1^u$   | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|--|---------------------------------------|------------|
| $u = 1.197390 + 0.397927I$<br>$a = 0.005516 - 0.546579I$<br>$b = 0.66877 + 1.28063I$   | $2.71082 - 1.81383I$                  | 0          |
| $u = 1.197390 - 0.397927I$<br>$a = 0.005516 + 0.546579I$<br>$b = 0.66877 - 1.28063I$   | $2.71082 + 1.81383I$                  | 0          |
| $u = 1.181700 + 0.455217I$<br>$a = -1.05213 - 0.98897I$<br>$b = 1.23536 + 1.54269I$    | $3.30802 + 5.60701I$                  | 0          |
| $u = 1.181700 - 0.455217I$<br>$a = -1.05213 + 0.98897I$<br>$b = 1.23536 - 1.54269I$    | $3.30802 - 5.60701I$                  | 0          |
| $u = -1.184150 + 0.456831I$<br>$a = 0.328157 + 0.804933I$<br>$b = -0.24589 - 1.53400I$ | $3.29330 - 2.94534I$                  | 0          |
| $u = -1.184150 - 0.456831I$<br>$a = 0.328157 - 0.804933I$<br>$b = -0.24589 + 1.53400I$ | $3.29330 + 2.94534I$                  | 0          |
| $u = 1.195820 + 0.443985I$<br>$a = 1.37811 + 1.50021I$<br>$b = 0.05336 - 2.03271I$     | $4.03956 + 1.53093I$                  | 0          |
| $u = 1.195820 - 0.443985I$<br>$a = 1.37811 - 1.50021I$<br>$b = 0.05336 + 2.03271I$     | $4.03956 - 1.53093I$                  | 0          |
| $u = -1.194680 + 0.465648I$<br>$a = -1.20311 + 1.79616I$<br>$b = -0.28010 - 2.17430I$  | $3.88377 - 7.20029I$                  | 0          |
| $u = -1.194680 - 0.465648I$<br>$a = -1.20311 - 1.79616I$<br>$b = -0.28010 + 2.17430I$  | $3.88377 + 7.20029I$                  | 0          |

| Solutions to $I_1^u$   | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape            |
|--|---------------------------------------|-----------------------|
| $u = -0.010080 + 0.715576I$<br>$a = -1.24270 - 0.73378I$<br>$b = 0.308954 + 0.451098I$ | $-0.028264 - 1.352720I$               | $-1.88211 + 0.54543I$ |
| $u = -0.010080 - 0.715576I$<br>$a = -1.24270 + 0.73378I$<br>$b = 0.308954 - 0.451098I$ | $-0.028264 + 1.352720I$               | $-1.88211 - 0.54543I$ |
| $u = -1.212120 + 0.432274I$<br>$a = 0.766667 - 0.450671I$<br>$b = -1.14266 + 1.29226I$ | $6.66680 - 1.70631I$                  | 0                     |
| $u = -1.212120 - 0.432274I$<br>$a = 0.766667 + 0.450671I$<br>$b = -1.14266 - 1.29226I$ | $6.66680 + 1.70631I$                  | 0                     |
| $u = -1.191240 + 0.499876I$<br>$a = -1.15247 + 1.32228I$<br>$b = 1.04357 - 2.42873I$   | $1.98773 - 10.53560I$                 | 0                     |
| $u = -1.191240 - 0.499876I$<br>$a = -1.15247 - 1.32228I$<br>$b = 1.04357 + 2.42873I$   | $1.98773 + 10.53560I$                 | 0                     |
| $u = 1.206990 + 0.476857I$<br>$a = 0.580406 + 0.543183I$<br>$b = -0.72477 - 1.55496I$  | $6.34811 + 7.22914I$                  | 0                     |
| $u = 1.206990 - 0.476857I$<br>$a = 0.580406 - 0.543183I$<br>$b = -0.72477 + 1.55496I$  | $6.34811 - 7.22914I$                  | 0                     |
| $u = 1.245050 + 0.367022I$<br>$a = 0.263536 + 0.632197I$<br>$b = 0.658637 + 0.468363I$ | $9.64537 - 7.82161I$                  | 0                     |
| $u = 1.245050 - 0.367022I$<br>$a = 0.263536 - 0.632197I$<br>$b = 0.658637 - 0.468363I$ | $9.64537 + 7.82161I$                  | 0                     |

| Solutions to $I_1^u$   | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape            |
|--|---------------------------------------|-----------------------|
| $u = -1.246200 + 0.382136I$<br>$a = 0.038717 + 0.547358I$<br>$b = -0.842986 + 0.574957I$ | $10.57580 + 1.62455I$                 | 0                     |
| $u = -1.246200 - 0.382136I$<br>$a = 0.038717 - 0.547358I$<br>$b = -0.842986 - 0.574957I$ | $10.57580 - 1.62455I$                 | 0                     |
| $u = -1.245340 + 0.402553I$<br>$a = 0.662864 - 0.742768I$<br>$b = 0.114048 + 0.113661I$  | $11.48720 + 1.46496I$                 | 0                     |
| $u = -1.245340 - 0.402553I$<br>$a = 0.662864 + 0.742768I$<br>$b = 0.114048 - 0.113661I$  | $11.48720 - 1.46496I$                 | 0                     |
| $u = -0.229275 + 0.647029I$<br>$a = -0.579282 - 1.224090I$<br>$b = 0.829861 - 0.556928I$ | $-3.17453 - 0.52670I$                 | $-9.02712 + 0.52794I$ |
| $u = -0.229275 - 0.647029I$<br>$a = -0.579282 + 1.224090I$<br>$b = 0.829861 + 0.556928I$ | $-3.17453 + 0.52670I$                 | $-9.02712 - 0.52794I$ |
| $u = 1.245450 + 0.419803I$<br>$a = -0.382581 - 0.719643I$<br>$b = -0.330973 - 0.038714I$ | $11.98730 + 4.79103I$                 | 0                     |
| $u = 1.245450 - 0.419803I$<br>$a = -0.382581 + 0.719643I$<br>$b = -0.330973 + 0.038714I$ | $11.98730 - 4.79103I$                 | 0                     |
| $u = -1.210620 + 0.527810I$<br>$a = -2.25559 + 0.82338I$<br>$b = 2.14131 - 2.26366I$     | $8.4995 - 16.9935I$                   | 0                     |
| $u = -1.210620 - 0.527810I$<br>$a = -2.25559 - 0.82338I$<br>$b = 2.14131 + 2.26366I$     | $8.4995 + 16.9935I$                   | 0                     |

| Solutions to $I_1^u$  | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape            |
|---|---------------------------------------|-----------------------|
| $u = 1.216030 + 0.519338I$<br>$a = 1.99835 + 0.60348I$<br>$b = -1.97723 - 2.00701I$     | $9.5945 + 10.8498I$                   | 0                     |
| $u = 1.216030 - 0.519338I$<br>$a = 1.99835 - 0.60348I$<br>$b = -1.97723 + 2.00701I$     | $9.5945 - 10.8498I$                   | 0                     |
| $u = 1.221780 + 0.505858I$<br>$a = -1.83357 - 0.90573I$<br>$b = 1.52263 + 1.79888I$     | $10.7454 + 10.7319I$                  | 0                     |
| $u = 1.221780 - 0.505858I$<br>$a = -1.83357 + 0.90573I$<br>$b = 1.52263 - 1.79888I$     | $10.7454 - 10.7319I$                  | 0                     |
| $u = -1.227710 + 0.493367I$<br>$a = 1.76734 - 0.69562I$<br>$b = -1.57118 + 1.65545I$    | $11.45740 - 4.52311I$                 | 0                     |
| $u = -1.227710 - 0.493367I$<br>$a = 1.76734 + 0.69562I$<br>$b = -1.57118 - 1.65545I$    | $11.45740 + 4.52311I$                 | 0                     |
| $u = 0.451798 + 0.412784I$<br>$a = 1.286600 - 0.192388I$<br>$b = -0.151873 - 0.415600I$ | $-1.49122 - 0.27727I$                 | $-6.33963 + 0.19121I$ |
| $u = 0.451798 - 0.412784I$<br>$a = 1.286600 + 0.192388I$<br>$b = -0.151873 + 0.415600I$ | $-1.49122 + 0.27727I$                 | $-6.33963 - 0.19121I$ |
| $u = 0.147589 + 0.554230I$<br>$a = -0.385611 - 0.500096I$<br>$b = 0.283515 + 0.578313I$ | $-0.05525 - 1.76673I$                 | $-0.22399 + 3.93080I$ |
| $u = 0.147589 - 0.554230I$<br>$a = -0.385611 + 0.500096I$<br>$b = 0.283515 - 0.578313I$ | $-0.05525 + 1.76673I$                 | $-0.22399 - 3.93080I$ |

**II.**

$$I_2^u = \langle u^3 + 2b + 2a - 2u, -2u^3a + 2u^2a - u^3 + 2a^2 + u^2 - 2a + 2u - 4, u^4 - 2u^2 + 2 \rangle$$

**(i) Arc colorings**

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

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

$$a_1 = \begin{pmatrix} a \\ -\frac{1}{2}u^3 - a + u \end{pmatrix}$$

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

$$a_{11} = \begin{pmatrix} \frac{1}{2}u^3a - \frac{1}{2}u^3 - au + \frac{3}{2}u^2 + a \\ \frac{1}{2}u^3 + au - 3u^2 - a + 2 \end{pmatrix}$$

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

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

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

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

$$a_6 = \begin{pmatrix} a \\ -\frac{1}{2}u^3 - a + u \end{pmatrix}$$

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

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

**(ii) Obstruction class = 1**

**(iii) Cusp Shapes =  $4u^2a - 2u^3 - 4u^2 - 4a + 4u$**

(iv) u-Polynomials at the component

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



(v) Riley Polynomials at the component

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

(vi) Complex Volumes and Cusp Shapes

| Solutions to $I_2^u$        | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape            |
|-----------------------------|---------------------------------------|-----------------------|
| $u = 1.098680 + 0.455090I$  |                                       |                       |
| $a = 1.187820 + 0.276887I$  | $0.82247 + 1.63398I$                  | $-2.00000 - 0.53590I$ |
| $b = -0.410936 - 0.598684I$ |                                       |                       |
| $u = 1.098680 + 0.455090I$  |                                       |                       |
| $a = -0.544228 + 0.276887I$ | $0.82247 + 5.69375I$                  | $-2.00000 - 7.46410I$ |
| $b = 1.32112 - 0.59868I$    |                                       |                       |
| $u = 1.098680 - 0.455090I$  |                                       |                       |
| $a = 1.187820 - 0.276887I$  | $0.82247 - 1.63398I$                  | $-2.00000 + 0.53590I$ |
| $b = -0.410936 + 0.598684I$ |                                       |                       |
| $u = 1.098680 - 0.455090I$  |                                       |                       |
| $a = -0.544228 - 0.276887I$ | $0.82247 - 5.69375I$                  | $-2.00000 + 7.46410I$ |
| $b = 1.32112 + 0.59868I$    |                                       |                       |
| $u = -1.098680 + 0.455090I$ |                                       |                       |
| $a = 0.544228 + 1.276890I$  | $0.82247 - 1.63398I$                  | $-2.00000 + 0.53590I$ |
| $b = -1.32112 - 1.59868I$   |                                       |                       |
| $u = -1.098680 + 0.455090I$ |                                       |                       |
| $a = -1.18782 + 1.27689I$   | $0.82247 - 5.69375I$                  | $-2.00000 + 7.46410I$ |
| $b = 0.41094 - 1.59868I$    |                                       |                       |
| $u = -1.098680 - 0.455090I$ |                                       |                       |
| $a = 0.544228 - 1.276890I$  | $0.82247 + 1.63398I$                  | $-2.00000 - 0.53590I$ |
| $b = -1.32112 + 1.59868I$   |                                       |                       |
| $u = -1.098680 - 0.455090I$ |                                       |                       |
| $a = -1.18782 - 1.27689I$   | $0.82247 + 5.69375I$                  | $-2.00000 - 7.46410I$ |
| $b = 0.41094 + 1.59868I$    |                                       |                       |

$$\text{III. } I_1^v = \langle a, b - v - 1, v^2 + v + 1 \rangle$$

(i) Arc colorings

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

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

$$a_1 = \begin{pmatrix} 0 \\ v + 1 \end{pmatrix}$$

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

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

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

$$a_2 = \begin{pmatrix} v \\ v + 1 \end{pmatrix}$$

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

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

$$a_6 = \begin{pmatrix} 0 \\ -v - 1 \end{pmatrix}$$

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

$$a_{12} = \begin{pmatrix} v + 1 \\ v \end{pmatrix}$$

(ii) Obstruction class = 1

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

(iv) u-Polynomials at the component

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

(v) Riley Polynomials at the component

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

(vi) Complex Volumes and Cusp Shapes

| Solutions to $I_1^v$        | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape            |
|-----------------------------|---------------------------------------|-----------------------|
| $v = -0.500000 + 0.866025I$ |                                       |                       |
| $a = 0$                     | $-1.64493 - 2.02988I$                 | $-6.00000 + 3.46410I$ |
| $b = 0.500000 + 0.866025I$  |                                       |                       |
| $v = -0.500000 - 0.866025I$ |                                       |                       |
| $a = 0$                     | $-1.64493 + 2.02988I$                 | $-6.00000 - 3.46410I$ |
| $b = 0.500000 - 0.866025I$  |                                       |                       |

#### IV. u-Polynomials

| Crossings  | u-Polynomials at each crossing  |
|------------|---|
| $c_1$      | $((u - 1)^{10})(u^{100} + 45u^{99} + \dots + 75u + 1)$                |
| $c_2$      | $((u - 1)^2)(u + 1)^8(u^{100} + 3u^{99} + \dots - 17u + 1)$           |
| $c_3, c_9$ | $u^2(u^4 - 2u^2 + 2)^2(u^{100} - u^{99} + \dots + 4u + 4)$            |
| $c_4, c_7$ | $u^2(u^4 + 2u^2 + 2)^2(u^{100} - 3u^{99} + \dots + 3612u + 748)$      |
| $c_5$      | $((u - 1)^8)(u + 1)^2(u^{100} + 3u^{99} + \dots - 17u + 1)$           |
| $c_6$      | $((u^2 - u + 1)^4)(u^2 + u + 1)(u^{100} - 2u^{99} + \dots + 12u + 5)$ |
| $c_8$      | $u^2(u^2 + 2u + 2)^4(u^{100} - 55u^{99} + \dots - 80u + 16)$          |
| $c_{10}$   | $((u^2 - u + 1)^5)(u^{100} + 32u^{99} + \dots + 46u + 25)$            |
| $c_{11}$   | $(u^2 - u + 1)(u^2 + u + 1)^4(u^{100} - 2u^{99} + \dots + 12u + 5)$   |
| $c_{12}$   | $((u^2 + u + 1)^5)(u^{100} + 32u^{99} + \dots + 46u + 25)$            |

### V. Riley Polynomials

| Crossings        | Riley Polynomials at each crossing   |
|------------------|--|
| $c_1$            | $((y-1)^{10})(y^{100} + 35y^{99} + \dots - 3619y + 1)$                             |
| $c_2, c_5$       | $((y-1)^{10})(y^{100} - 45y^{99} + \dots - 75y + 1)$                               |
| $c_3, c_9$       | $y^2(y^2 - 2y + 2)^4(y^{100} - 55y^{99} + \dots - 80y + 16)$                       |
| $c_4, c_7$       | $y^2(y^2 + 2y + 2)^4(y^{100} + 85y^{99} + \dots - 2.11968 \times 10^7 y + 559504)$ |
| $c_6, c_{11}$    | $((y^2 + y + 1)^5)(y^{100} + 32y^{99} + \dots + 46y + 25)$                         |
| $c_8$            | $y^2(y^2 + 4)^4(y^{100} - 15y^{99} + \dots - 5376y + 256)$                         |
| $c_{10}, c_{12}$ | $((y^2 + y + 1)^5)(y^{100} + 80y^{99} + \dots + 107034y + 625)$                    |