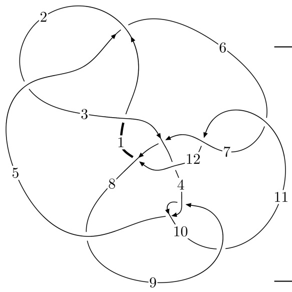
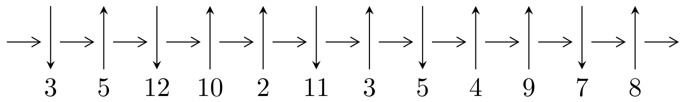
# $12n_{0397}$ ($K12n_{0397}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$I_1^u = \langle u^{23} + 8u^{22} + \cdots + 2b + 26,\ -23u^{23} - 133u^{22} + \cdots + 8a - 112,\ u^{24} + 7u^{23} + \cdots + 44u + 8\rangle$$

$$\begin{aligned} I_2^u = \langle & 2u^{17} - 9u^{15} + 21u^{13} - 28u^{11} + 2u^{10} + 23u^9 - 7u^8 - 7u^7 + 10u^6 - 5u^5 - 6u^4 + 7u^3 + b - 3u + 1, \\ & - 2u^{17} + u^{16} + \cdots + a - 3, \\ & u^{18} - 5u^{16} + 13u^{14} - 20u^{12} + u^{11} + 20u^{10} - 4u^9 - 11u^8 + 7u^7 + u^6 - 6u^5 + 4u^4 + 2u^3 - 3u^2 + 1\rangle \end{aligned}$$

$$\begin{aligned} I_3^u = \langle & 109a^3u^2 - 389a^2u^2 + \cdots + 1134a - 188,\ a^4 + a^3u + a^2u^2 - a^3 - 10a^2u - 5u^2a - 3au - 5a - 4u - 1, \\ & u^3 - u^2 + 1\rangle \end{aligned}$$

$$I_4^u = \langle b + u,\ a^2 + au + 4u^2 - 6u + 4,\ u^3 - u^2 + 1\rangle$$

* 4 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 60 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.** $\boldsymbol{I_1^u = \langle u^{23} + 8u^{22} + \cdots + 2b + 26,\ -23u^{23} - 133u^{22} + \cdots + 8a - 112,\ u^{24} + 7u^{23} + \cdots + 44u + 8\rangle}$

**(i) Arc colorings**

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

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

$$a_5 = \begin{pmatrix} 1 \\ -u^2 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} \frac{23}{8}u^{23} + \frac{133}{8}u^{22} + \cdots + \frac{145}{2}u + 14 \\ -\frac{1}{2}u^{23} - 4u^{22} + \cdots - \frac{105}{2}u - 13 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 3.37500u^{23} + 20.8750u^{22} + \cdots + 119.750u + 25.5000 \\ -\frac{3}{4}u^{23} - \frac{25}{4}u^{22} + \cdots - 71u - 17 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} 3.12500u^{23} + 18.1250u^{22} + \cdots + 96.7500u + 20.5000 \\ -\frac{15}{4}u^{23} - \frac{89}{4}u^{22} + \cdots - 117u - 25 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} -\frac{57}{8}u^{23} - \frac{339}{8}u^{22} + \cdots - \frac{359}{2}u - 34 \\ -2u^{23} - \frac{13}{2}u^{22} + \cdots + \frac{105}{2}u + 15 \end{pmatrix}$$

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

$$a_8 = \begin{pmatrix} -u^3 \\ u^5 - u^3 + u \end{pmatrix}$$

$$a_7 = \begin{pmatrix} \frac{21}{8}u^{23} + \frac{133}{8}u^{22} + \cdots + \frac{375}{4}u + 19 \\ -\frac{1}{4}u^{23} - \frac{13}{4}u^{22} + \cdots - \frac{63}{2}u - 7 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} u^3 \\ -u^3 + u \end{pmatrix}$$

$$a_6 = \begin{pmatrix} -\frac{27}{8}u^{23} - \frac{155}{8}u^{22} + \cdots - \frac{281}{4}u - 13 \\ \frac{17}{4}u^{23} + \frac{105}{4}u^{22} + \cdots + \frac{273}{2}u + 27 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 5u^{23} + 31u^{22} + 68u^{21} + 5u^{20} - 274u^{19} - 532u^{18} - 143u^{17} + 1013u^{16} + 1701u^{15} + 430u^{14} - 2124u^{13} - 3067u^{12} - 781u^{11} + 2554u^{10} + 3417u^9 + 1220u^8 - 1377u^7 - 2052u^6 - 1028u^5 + 135u^4 + 565u^3 + 416u^2 + 168u + 30$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{24} + 40u^{23} + \cdots - 13u + 1$ |
| $c_2, c_5, c_7$ | $u^{24} + 20u^{22} + \cdots - 3u + 1$ |
| $c_3$ | $u^{24} - 12u^{23} + \cdots - 80u + 8$ |
| $c_4, c_9$ | $u^{24} + 7u^{23} + \cdots + 44u + 8$ |
| $c_6, c_{11}$ | $u^{24} + u^{23} + \cdots - 2u + 1$ |
| $c_8$ | $u^{24} + 21u^{23} + \cdots + 6588u + 1192$ |
| $c_{10}$ | $u^{24} - 11u^{23} + \cdots - 16u + 64$ |
| $c_{12}$ | $u^{24} - u^{23} + \cdots - 146u + 481$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{24} - 132y^{23} + \cdots - 117y + 1$ |
| $c_2, c_5, c_7$ | $y^{24} + 40y^{23} + \cdots - 13y + 1$ |
| $c_3$ | $y^{24} + 2y^{23} + \cdots - 544y + 64$ |
| $c_4, c_9$ | $y^{24} - 11y^{23} + \cdots - 16y + 64$ |
| $c_6, c_{11}$ | $y^{24} - 33y^{23} + \cdots + 38y + 1$ |
| $c_8$ | $y^{24} + y^{23} + \cdots + 2294768y + 1420864$ |
| $c_{10}$ | $y^{24} + 5y^{23} + \cdots - 29952y + 4096$ |
| $c_{12}$ | $y^{24} + 57y^{23} + \cdots - 2861140y + 231361$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.915808 + 0.204074I$<br>$a = 0.308825 - 0.358584I$<br>$b = 0.420523 + 0.284056I$ | $1.43685 + 0.26824I$ | $8.25591 - 0.95433I$ |
| $u = 0.915808 - 0.204074I$<br>$a = 0.308825 + 0.358584I$<br>$b = 0.420523 - 0.284056I$ | $1.43685 - 0.26824I$ | $8.25591 + 0.95433I$ |
| $u = -0.768219 + 0.429349I$<br>$a = -0.123850 + 0.819559I$<br>$b = -0.846044 - 0.245760I$ | $-1.24603 - 1.86074I$ | $-2.80514 + 4.17649I$ |
| $u = -0.768219 - 0.429349I$<br>$a = -0.123850 - 0.819559I$<br>$b = -0.846044 + 0.245760I$ | $-1.24603 + 1.86074I$ | $-2.80514 - 4.17649I$ |
| $u = -0.485800 + 1.043550I$<br>$a = 0.700910 - 0.279759I$<br>$b = 1.10350 + 1.17587I$ | $-16.7128 - 1.0407I$ | $-2.67460 + 1.48969I$ |
| $u = -0.485800 - 1.043550I$<br>$a = 0.700910 + 0.279759I$<br>$b = 1.10350 - 1.17587I$ | $-16.7128 + 1.0407I$ | $-2.67460 - 1.48969I$ |
| $u = -0.533713 + 1.023160I$<br>$a = 0.687357 + 0.197125I$<br>$b = 1.16784 - 1.06324I$ | $-17.0702 + 7.3018I$ | $-2.46091 - 2.45661I$ |
| $u = -0.533713 - 1.023160I$<br>$a = 0.687357 - 0.197125I$<br>$b = 1.16784 + 1.06324I$ | $-17.0702 - 7.3018I$ | $-2.46091 + 2.45661I$ |
| $u = -0.454642 + 0.697047I$<br>$a = 1.245930 + 0.051953I$<br>$b = 0.672512 - 0.074959I$ | $-2.81566 + 1.10173I$ | $-1.51034 + 1.46986I$ |
| $u = -0.454642 - 0.697047I$<br>$a = 1.245930 - 0.051953I$<br>$b = 0.672512 + 0.074959I$ | $-2.81566 - 1.10173I$ | $-1.51034 - 1.46986I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.115630 + 0.467131I$<br>$a = 1.09132 + 1.37936I$<br>$b = 0.103648 - 1.034020I$ | $3.47697 + 2.26614I$ | $7.38300 + 0.31343I$ |
| $u = 1.115630 - 0.467131I$<br>$a = 1.09132 - 1.37936I$<br>$b = 0.103648 + 1.034020I$ | $3.47697 - 2.26614I$ | $7.38300 - 0.31343I$ |
| $u = -1.065690 + 0.574907I$<br>$a = 0.844325 - 1.000110I$<br>$b = 0.707678 + 0.133194I$ | $-1.01811 - 6.00438I$ | $3.14307 + 1.73510I$ |
| $u = -1.065690 - 0.574907I$<br>$a = 0.844325 + 1.000110I$<br>$b = 0.707678 - 0.133194I$ | $-1.01811 + 6.00438I$ | $3.14307 - 1.73510I$ |
| $u = -1.162360 + 0.452653I$<br>$a = -0.55210 + 1.89083I$<br>$b = -0.452316 - 1.190600I$ | $3.55309 - 5.72713I$ | $8.49615 + 7.00160I$ |
| $u = -1.162360 - 0.452653I$<br>$a = -0.55210 - 1.89083I$<br>$b = -0.452316 + 1.190600I$ | $3.55309 + 5.72713I$ | $8.49615 - 7.00160I$ |
| $u = -0.068716 + 0.634302I$<br>$a = 0.139760 - 0.437493I$<br>$b = -0.335421 + 0.843529I$ | $0.48313 + 1.57128I$ | $3.43704 - 4.17540I$ |
| $u = -0.068716 - 0.634302I$<br>$a = 0.139760 + 0.437493I$<br>$b = -0.335421 - 0.843529I$ | $0.48313 - 1.57128I$ | $3.43704 + 4.17540I$ |
| $u = 1.373310 + 0.032921I$<br>$a = -0.55767 + 1.51729I$<br>$b = 1.20249 - 1.15069I$ | $-9.59467 + 4.37178I$ | $1.10728 - 2.37526I$ |
| $u = 1.373310 - 0.032921I$<br>$a = -0.55767 - 1.51729I$<br>$b = 1.20249 + 1.15069I$ | $-9.59467 - 4.37178I$ | $1.10728 + 2.37526I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.165950 + 0.738930I$<br>$a = 1.12460 - 1.76379I$<br>$b = 1.18433 + 1.02927I$ | $-15.0954 - 13.6960I$ | $-0.56874 + 6.51708I$ |
| $u = -1.165950 - 0.738930I$<br>$a = 1.12460 + 1.76379I$<br>$b = 1.18433 - 1.02927I$ | $-15.0954 + 13.6960I$ | $-0.56874 - 6.51708I$ |
| $u = -1.199670 + 0.725513I$<br>$a = -0.909394 - 0.070498I$<br>$b = 1.07127 - 1.22148I$ | $-14.4845 - 5.3708I$ | $-0.80273 + 2.57897I$ |
| $u = -1.199670 - 0.725513I$<br>$a = -0.909394 + 0.070498I$<br>$b = 1.07127 + 1.22148I$ | $-14.4845 + 5.3708I$ | $-0.80273 - 2.57897I$ |

**II.**

$$\boldsymbol{I_2^u = \langle 2u^{17}-9u^{15}+\cdots+b+1,\ -2u^{17}+u^{16}+\cdots+a-3,\ u^{18}-5u^{16}+\cdots-3u^2+1\rangle}$$

**(i) Arc colorings**

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

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

$$a_5 = \begin{pmatrix} 1 \\ -u^2 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} 2u^{17} - u^{16} + \cdots - 3u + 3 \\ -2u^{17} + 9u^{15} + \cdots + 3u - 1 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 2u^{17} - 3u^{16} + \cdots - 3u + 4 \\ -2u^{17} + 2u^{16} + \cdots + 3u - 3 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} 3u^{17} - 3u^{16} + \cdots - 4u + 4 \\ -3u^{17} + 2u^{16} + \cdots + 4u - 3 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 3u^{17} - 12u^{15} + \cdots - 4u + 2 \\ -3u^{17} + 13u^{15} + \cdots + 4u - 1 \end{pmatrix}$$

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

$$a_8 = \begin{pmatrix} -u^3 \\ u^5 - u^3 + u \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -2u^{17} - u^{16} + \cdots - 2u^2 + 5u \\ -u^{15} + 4u^{13} - 8u^{11} + 8u^9 - u^8 - 4u^7 + 3u^6 - u^5 - 3u^4 + 2u^3 - u + 1 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} u^3 \\ -u^3 + u \end{pmatrix}$$

$$a_6 = \begin{pmatrix} -2u^{17} + 10u^{15} + \cdots + 5u - 1 \\ -u^{15} + u^{14} + \cdots - 2u + 2 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 8u^{17} - 9u^{16} - 36u^{15} + 40u^{14} + 85u^{13} - 93u^{12} - 115u^{11} + 128u^{10} + 88u^9 - 123u^8 - u^7 + 66u^6 - 62u^5 - 10u^4 + 52u^3 - 25u^2 - 10u + 9$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{18} - 18u^{17} + \cdots - 11u + 1$ |
| $c_2, c_7$ | $u^{18} + 9u^{16} + \cdots - u + 1$ |
| $c_3$ | $u^{18} + 7u^{17} + \cdots - 8u^2 + 1$ |
| $c_4$ | $u^{18} - 5u^{16} + \cdots - 3u^2 + 1$ |
| $c_5$ | $u^{18} + 9u^{16} + \cdots + u + 1$ |
| $c_6$ | $u^{18} + u^{17} + \cdots + 2u + 1$ |
| $c_8$ | $u^{18} + 3u^{16} + \cdots - 3u^2 + 1$ |
| $c_9$ | $u^{18} - 5u^{16} + \cdots - 3u^2 + 1$ |
| $c_{10}$ | $u^{18} - 10u^{17} + \cdots - 6u + 1$ |
| $c_{11}$ | $u^{18} - u^{17} + \cdots - 2u + 1$ |
| $c_{12}$ | $u^{18} + u^{17} + \cdots - 4u^2 + 1$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{18} - 34y^{17} + \cdots + 15y + 1$ |
| $c_2, c_5, c_7$ | $y^{18} + 18y^{17} + \cdots + 11y + 1$ |
| $c_3$ | $y^{18} + 3y^{17} + \cdots - 16y + 1$ |
| $c_4, c_9$ | $y^{18} - 10y^{17} + \cdots - 6y + 1$ |
| $c_6, c_{11}$ | $y^{18} - 7y^{17} + \cdots - 10y + 1$ |
| $c_8$ | $y^{18} + 6y^{17} + \cdots - 6y + 1$ |
| $c_{10}$ | $y^{18} + 2y^{17} + \cdots - 2y + 1$ |
| $c_{12}$ | $y^{18} + 19y^{17} + \cdots - 8y + 1$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.904746 + 0.245141I$<br>$a = 0.82192 + 2.64809I$<br>$b = 0.886797 - 0.175898I$ | $-4.91866 + 1.07876I$ | $-1.73448 - 6.58149I$ |
| $u = 0.904746 - 0.245141I$<br>$a = 0.82192 - 2.64809I$<br>$b = 0.886797 + 0.175898I$ | $-4.91866 - 1.07876I$ | $-1.73448 + 6.58149I$ |
| $u = -1.016240 + 0.389137I$<br>$a = 0.572143 - 0.544697I$<br>$b = -1.041090 + 0.572987I$ | $-0.238865 + 0.538366I$ | $0.033663 + 0.201088I$ |
| $u = -1.016240 - 0.389137I$<br>$a = 0.572143 + 0.544697I$<br>$b = -1.041090 - 0.572987I$ | $-0.238865 - 0.538366I$ | $0.033663 - 0.201088I$ |
| $u = -0.881768 + 0.726056I$<br>$a = -1.46172 - 0.04608I$<br>$b = 0.357663 - 0.073463I$ | $-8.08514 - 2.77083I$ | $1.63500 + 2.47333I$ |
| $u = -0.881768 - 0.726056I$<br>$a = -1.46172 + 0.04608I$<br>$b = 0.357663 + 0.073463I$ | $-8.08514 + 2.77083I$ | $1.63500 - 2.47333I$ |
| $u = 1.037690 + 0.534998I$<br>$a = -1.34462 - 1.39462I$<br>$b = -0.838028 + 0.445978I$ | $-1.29375 + 6.79726I$ | $0.08657 - 10.35459I$ |
| $u = 1.037690 - 0.534998I$<br>$a = -1.34462 + 1.39462I$<br>$b = -0.838028 - 0.445978I$ | $-1.29375 - 6.79726I$ | $0.08657 + 10.35459I$ |
| $u = 0.551142 + 0.552499I$<br>$a = -1.46793 - 0.56794I$<br>$b = -0.719476 - 0.551592I$ | $-2.79898 - 2.36719I$ | $-1.07277 + 3.81163I$ |
| $u = 0.551142 - 0.552499I$<br>$a = -1.46793 + 0.56794I$<br>$b = -0.719476 + 0.551592I$ | $-2.79898 + 2.36719I$ | $-1.07277 - 3.81163I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.098568 + 0.770121I$<br>$a = -0.1181270 + 0.0762608I$<br>$b = -0.399233 + 1.101750I$ | $-0.95237 + 1.65920I$ | $-2.51109 - 2.64437I$ |
| $u = 0.098568 - 0.770121I$<br>$a = -0.1181270 - 0.0762608I$<br>$b = -0.399233 - 1.101750I$ | $-0.95237 - 1.65920I$ | $-2.51109 + 2.64437I$ |
| $u = -0.703037 + 0.218633I$<br>$a = 0.48139 + 1.75543I$<br>$b = -1.019720 - 0.825776I$ | $-1.54644 - 3.40184I$ | $-4.66379 + 8.73031I$ |
| $u = -0.703037 - 0.218633I$<br>$a = 0.48139 - 1.75543I$<br>$b = -1.019720 + 0.825776I$ | $-1.54644 + 3.40184I$ | $-4.66379 - 8.73031I$ |
| $u = -1.194980 + 0.426737I$<br>$a = -0.46757 + 1.90862I$<br>$b = -0.59911 - 1.38196I$ | $2.73425 - 5.77721I$ | $-1.49014 + 6.51918I$ |
| $u = -1.194980 - 0.426737I$<br>$a = -0.46757 - 1.90862I$<br>$b = -0.59911 + 1.38196I$ | $2.73425 + 5.77721I$ | $-1.49014 - 6.51918I$ |
| $u = 1.203880 + 0.487334I$<br>$a = 0.98453 + 1.10774I$<br>$b = -0.127799 - 1.272500I$ | $2.29556 + 3.01264I$ | $0.71705 - 2.77521I$ |
| $u = 1.203880 - 0.487334I$<br>$a = 0.98453 - 1.10774I$<br>$b = -0.127799 + 1.272500I$ | $2.29556 - 3.01264I$ | $0.71705 + 2.77521I$ |

## III. $I^u_3 = \langle 109a^3u^2 - 389a^2u^2 + \cdots + 1134a - 188,\ a^2u^2 - 5u^2a + \cdots - 5a - 1,\ u^3 - u^2 + 1\rangle$

**(i) Arc colorings**

$$a_4 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_5 = \begin{pmatrix} 1 \\ -u^2 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} a \\ -0.0527590a^3u^2 + 0.188287a^2u^2 + \cdots - 0.548887a + 0.0909971 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} 0.0387222a^3u^2 + 0.260891a^2u^2 + \cdots + 0.861568a + 0.836883 \\ -0.227009a^3u^2 + 0.264279a^2u^2 + \cdots - 2.42594a - 0.424976 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} 0.170378a^3u^2 + 0.0479187a^2u^2 + \cdots + 1.79090a + 0.582285 \\ -0.251210a^3u^2 + 0.0387222a^2u^2 + \cdots - 2.71442a - 1.13553 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} -0.300581a^3u^2 + 0.118587a^2u^2 + \cdots - 1.06292a - 1.16505 \\ -0.174250a^3u^2 + 0.0759923a^2u^2 + \cdots - 0.877057a - 0.515973 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} -u \\ u \end{pmatrix}$$
$$a_8 = \begin{pmatrix} -u^2 + 1 \\ -u^2 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} 0.316070a^3u^2 - 0.114230a^2u^2 + \cdots + 2.40755a + 2.39981 \\ -0.0963214a^3u^2 + 0.0822846a^2u^2 + \cdots - 1.26815a - 0.787996 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} u^2 - 1 \\ -u^2 + u + 1 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} 0.188771a^3u^2 - 0.0406583a^2u^2 + \cdots + 1.45015a + 1.64230 \\ -0.241530a^3u^2 + 0.228945a^2u^2 + \cdots - 1.99903a - 0.551307 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= \frac{218}{1033}a^3u^2 - \frac{938}{1033}a^3u - \frac{778}{1033}a^2u^2 + \frac{198}{1033}a^3 + \frac{1092}{1033}a^2u + \frac{7756}{1033}u^2a - \frac{138}{1033}a^2 - \frac{2856}{1033}au + \frac{2132}{1033}u^2 + \frac{2268}{1033}a - \frac{3582}{1033}u - \frac{2442}{1033}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{12} + 20u^{11} + \cdots - 972u + 729$ |
| $c_2, c_5, c_7$ | $u^{12} + 4u^{11} + \cdots + 108u + 27$ |
| $c_3$ | $(u^3 + u^2 - 1)^4$ |
| $c_4, c_9$ | $(u^3 - u^2 + 1)^4$ |
| $c_6, c_{11}$ | $u^{12} + 3u^{11} + \cdots + 8u + 8$ |
| $c_8$ | $(u^3 - 3u^2 + 2u + 1)^4$ |
| $c_{10}$ | $(u^3 - u^2 + 2u - 1)^4$ |
| $c_{12}$ | $u^{12} + 5u^{11} + \cdots - 52u + 8$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{12} - 60y^{11} + \cdots + 157464y + 531441$ |
| $c_2, c_5, c_7$ | $y^{12} + 20y^{11} + \cdots - 972y + 729$ |
| $c_3, c_4, c_9$ | $(y^3 - y^2 + 2y - 1)^4$ |
| $c_6, c_{11}$ | $y^{12} + y^{11} + \cdots + 288y + 64$ |
| $c_8$ | $(y^3 - 5y^2 + 10y - 1)^4$ |
| $c_{10}$ | $(y^3 + 3y^2 + 2y - 1)^4$ |
| $c_{12}$ | $y^{12} + 37y^{11} + \cdots - 1360y + 64$ |

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

| Solutions to $I_3^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.877439 + 0.744862I$<br>$a = -0.803930 - 0.531274I$<br>$b = -0.877439 + 0.744862I$ | $-4.93480 + 5.65624I$ | $-2.00000 - 5.95889I$ |
| $u = 0.877439 + 0.744862I$<br>$a = -0.423353 + 0.379086I$<br>$b = 0.754878$ | $-9.07239 + 2.82812I$ | $-8.52927 - 2.97945I$ |
| $u = 0.877439 + 0.744862I$<br>$a = -2.29278 - 1.33815I$<br>$b = -0.877439 + 0.744862I$ | $-4.93480 + 5.65624I$ | $-2.00000 - 5.95889I$ |
| $u = 0.877439 + 0.744862I$<br>$a = 3.64263 + 0.74547I$<br>$b = 0.754878$ | $-9.07239 + 2.82812I$ | $-8.52927 - 2.97945I$ |
| $u = 0.877439 - 0.744862I$<br>$a = -0.803930 + 0.531274I$<br>$b = -0.877439 - 0.744862I$ | $-4.93480 - 5.65624I$ | $-2.00000 + 5.95889I$ |
| $u = 0.877439 - 0.744862I$<br>$a = -0.423353 - 0.379086I$<br>$b = 0.754878$ | $-9.07239 - 2.82812I$ | $-8.52927 + 2.97945I$ |
| $u = 0.877439 - 0.744862I$<br>$a = -2.29278 + 1.33815I$<br>$b = -0.877439 - 0.744862I$ | $-4.93480 - 5.65624I$ | $-2.00000 + 5.95889I$ |
| $u = 0.877439 - 0.744862I$<br>$a = 3.64263 - 0.74547I$<br>$b = 0.754878$ | $-9.07239 - 2.82812I$ | $-8.52927 + 2.97945I$ |
| $u = -0.754878$<br>$a = 0.374103 + 0.381158I$<br>$b = -0.877439 - 0.744862I$ | $-0.79722 - 2.82812I$ | $4.52927 + 2.97945I$ |
| $u = -0.754878$<br>$a = 0.374103 - 0.381158I$<br>$b = -0.877439 + 0.744862I$ | $-0.79722 + 2.82812I$ | $4.52927 - 2.97945I$ |

| Solutions to $I_3^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.754878$<br>$a = \quad 0.50334 + 2.61282I$<br>$b = -0.877439 - 0.744862I$ | $-0.79722 - 2.82812I$ | $4.52927 + 2.97945I$ |
| $u = -0.754878$<br>$a = \quad 0.50334 - 2.61282I$<br>$b = -0.877439 + 0.744862I$ | $-0.79722 + 2.82812I$ | $4.52927 - 2.97945I$ |

**IV. $I_4^u = \langle b + u,\ a^2 + au + 4u^2 - 6u + 4,\ u^3 - u^2 + 1\rangle$**

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= -2$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^6 + 7u^5 + 30u^4 + 79u^3 + 120u^2 + 112u + 64$ |
| $c_2, c_5, c_7$ | $u^6 - 3u^5 + 8u^4 - 11u^3 + 16u^2 - 12u + 8$ |
| $c_3$ | $(u^3 + u^2 - 1)^2$ |
| $c_4, c_9$ | $(u^3 - u^2 + 1)^2$ |
| $c_6, c_{11}$ | $u^6 - 5u^4 - 4u^3 + 6u^2 + 12u + 7$ |
| $c_8$ | $(u^3 - 3u^2 + 2u + 1)^2$ |
| $c_{10}$ | $(u^3 - u^2 + 2u - 1)^2$ |
| $c_{12}$ | $u^6 - 4u^5 + 9u^4 - 18u^3 + 34u^2 - 34u + 19$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^6 + 11y^5 + 34y^4 - 481y^3 + 544y^2 + 2816y + 4096$ |
| $c_2, c_5, c_7$ | $y^6 + 7y^5 + 30y^4 + 79y^3 + 120y^2 + 112y + 64$ |
| $c_3, c_4, c_9$ | $(y^3 - y^2 + 2y - 1)^2$ |
| $c_6, c_{11}$ | $y^6 - 10y^5 + 37y^4 - 62y^3 + 62y^2 - 60y + 49$ |
| $c_8$ | $(y^3 - 5y^2 + 10y - 1)^2$ |
| $c_{10}$ | $(y^3 + 3y^2 + 2y - 1)^2$ |
| $c_{12}$ | $y^6 + 2y^5 + 5y^4 + 54y^3 + 274y^2 + 136y + 361$ |

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

| Solutions to $I_4^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.877439 + 0.744862I$<br>$a = -1.176340 - 0.079183I$<br>$b = -0.877439 - 0.744862I$ | $-4.93480$ | $-2.00000$ |
| $u = 0.877439 + 0.744862I$<br>$a = 0.298897 - 0.665679I$<br>$b = -0.877439 - 0.744862I$ | $-4.93480$ | $-2.00000$ |
| $u = 0.877439 - 0.744862I$<br>$a = -1.176340 + 0.079183I$<br>$b = -0.877439 + 0.744862I$ | $-4.93480$ | $-2.00000$ |
| $u = 0.877439 - 0.744862I$<br>$a = 0.298897 + 0.665679I$<br>$b = -0.877439 + 0.744862I$ | $-4.93480$ | $-2.00000$ |
| $u = -0.754878$<br>$a = 0.37744 + 3.26591I$<br>$b = 0.754878$ | $-4.93480$ | $-2.00000$ |
| $u = -0.754878$<br>$a = 0.37744 - 3.26591I$<br>$b = 0.754878$ | $-4.93480$ | $-2.00000$ |

## V. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $(u^6+7u^5+30u^4+79u^3+120u^2+112u+64)$ $\cdot(u^{12}+20u^{11}+\cdots-972u+729)(u^{18}-18u^{17}+\cdots-11u+1)$ $\cdot(u^{24}+40u^{23}+\cdots-13u+1)$ |
| $c_2, c_7$ | $(u^6-3u^5+\cdots-12u+8)(u^{12}+4u^{11}+\cdots+108u+27)$ $\cdot(u^{18}+9u^{16}+\cdots-u+1)(u^{24}+20u^{22}+\cdots-3u+1)$ |
| $c_3$ | $((u^3+u^2-1)^6)(u^{18}+7u^{17}+\cdots-8u^2+1)(u^{24}-12u^{23}+\cdots-80u+8)$ |
| $c_4$ | $((u^3-u^2+1)^6)(u^{18}-5u^{16}+\cdots-3u^2+1)(u^{24}+7u^{23}+\cdots+44u+8)$ |
| $c_5$ | $(u^6-3u^5+\cdots-12u+8)(u^{12}+4u^{11}+\cdots+108u+27)$ $\cdot(u^{18}+9u^{16}+\cdots+u+1)(u^{24}+20u^{22}+\cdots-3u+1)$ |
| $c_6$ | $(u^6-5u^4-4u^3+6u^2+12u+7)(u^{12}+3u^{11}+\cdots+8u+8)$ $\cdot(u^{18}+u^{17}+\cdots+2u+1)(u^{24}+u^{23}+\cdots-2u+1)$ |
| $c_8$ | $((u^3-3u^2+2u+1)^6)(u^{18}+3u^{16}+\cdots-3u^2+1)$ $\cdot(u^{24}+21u^{23}+\cdots+6588u+1192)$ |
| $c_9$ | $((u^3-u^2+1)^6)(u^{18}-5u^{16}+\cdots-3u^2+1)(u^{24}+7u^{23}+\cdots+44u+8)$ |
| $c_{10}$ | $((u^3-u^2+2u-1)^6)(u^{18}-10u^{17}+\cdots-6u+1)$ $\cdot(u^{24}-11u^{23}+\cdots-16u+64)$ |
| $c_{11}$ | $(u^6-5u^4-4u^3+6u^2+12u+7)(u^{12}+3u^{11}+\cdots+8u+8)$ $\cdot(u^{18}-u^{17}+\cdots-2u+1)(u^{24}+u^{23}+\cdots-2u+1)$ |
| $c_{12}$ | $(u^6-4u^5+\cdots-34u+19)(u^{12}+5u^{11}+\cdots-52u+8)$ $\cdot(u^{18}+u^{17}+\cdots-4u^2+1)(u^{24}-u^{23}+\cdots-146u+481)$ |

## VI. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $(y^6+11y^5+34y^4-481y^3+544y^2+2816y+4096)$ $\cdot(y^{12}-60y^{11}+\cdots+157464y+531441)(y^{18}-34y^{17}+\cdots+15y+1)$ $\cdot(y^{24}-132y^{23}+\cdots-117y+1)$ |
| $c_2, c_5, c_7$ | $(y^6+7y^5+30y^4+79y^3+120y^2+112y+64)$ $\cdot(y^{12}+20y^{11}+\cdots-972y+729)(y^{18}+18y^{17}+\cdots+11y+1)$ $\cdot(y^{24}+40y^{23}+\cdots-13y+1)$ |
| $c_3$ | $((y^3-y^2+2y-1)^6)(y^{18}+3y^{17}+\cdots-16y+1)$ $\cdot(y^{24}+2y^{23}+\cdots-544y+64)$ |
| $c_4, c_9$ | $((y^3-y^2+2y-1)^6)(y^{18}-10y^{17}+\cdots-6y+1)$ $\cdot(y^{24}-11y^{23}+\cdots-16y+64)$ |
| $c_6, c_{11}$ | $(y^6-10y^5+37y^4-62y^3+62y^2-60y+49)$ $\cdot(y^{12}+y^{11}+\cdots+288y+64)(y^{18}-7y^{17}+\cdots-10y+1)$ $\cdot(y^{24}-33y^{23}+\cdots+38y+1)$ |
| $c_8$ | $((y^3-5y^2+10y-1)^6)(y^{18}+6y^{17}+\cdots-6y+1)$ $\cdot(y^{24}+y^{23}+\cdots+2294768y+1420864)$ |
| $c_{10}$ | $((y^3+3y^2+2y-1)^6)(y^{18}+2y^{17}+\cdots-2y+1)$ $\cdot(y^{24}+5y^{23}+\cdots-29952y+4096)$ |
| $c_{12}$ | $(y^6+2y^5+5y^4+54y^3+274y^2+136y+361)$ $\cdot(y^{12}+37y^{11}+\cdots-1360y+64)(y^{18}+19y^{17}+\cdots-8y+1)$ $\cdot(y^{24}+57y^{23}+\cdots-2861140y+231361)$ |