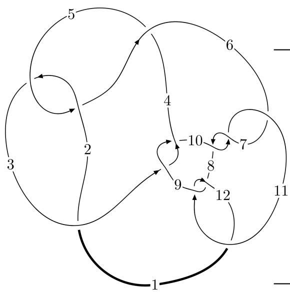
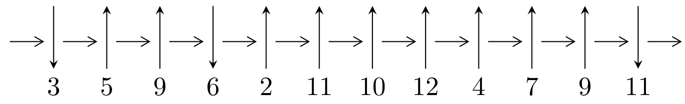
# $12n_{0270}$ $(K12n_{0270})$




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$
\begin{aligned}
I^u_1 &= \langle 159u^{20} - 349u^{19} + \cdots + 1024b + 97,\ 65u^{20} - 195u^{19} + \cdots + 2048a + 2111,\ u^{21} - 2u^{20} + \cdots + 5u^2 - 1\rangle \\
I^u_2 &= \langle 2u^7 + 5u^6 + 11u^5 + 22u^4 + 25u^3 + 24u^2 + 7b + 15u + 1, \\
&\quad - 19u^7 - 36u^6 - 87u^5 - 172u^4 - 186u^3 - 164u^2 + 14a - 133u - 3, \\
&\quad u^8 + 2u^7 + 5u^6 + 10u^5 + 12u^4 + 12u^3 + 11u^2 + 3u + 2\rangle \\
I^u_3 &= \langle -a^2 + 2au + b + 2a - 2u - 1,\ a^4 - 3a^3u - 4a^3 + 9a^2u + 5a^2 - 11au - 2a + 5u + 1,\ u^2 + 1\rangle \\
I^u_4 &= \langle 3642u^{11} + 10715u^{10} + \cdots + 16346b + 454,\ -9302u^{11} + 5482u^{10} + \cdots + 277882a - 125487, \\
&\quad u^{12} + 3u^{11} + 11u^{10} + 23u^9 + 46u^8 + 68u^7 + 94u^6 + 99u^5 + 97u^4 + 76u^3 + 52u^2 + 26u + 17\rangle \\
I^u_5 &= \langle b + 2a + 2,\ 4a^2 + 10a + 7,\ u + 1\rangle
\end{aligned}
$$

* 5 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 51 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.** $\boldsymbol{I^u_1 = \langle 159u^{20} - 349u^{19} + \cdots + 1024b + 97,\ 65u^{20} - 195u^{19} + \cdots + 2048a + 2111,\ u^{21} - 2u^{20} + \cdots + 5u^2 - 1\rangle}$

**(i) Arc colorings**

$$a_6 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_2 = \begin{pmatrix} -0.0317383u^{20} + 0.0952148u^{19} + \cdots + 6.03076u - 1.03076 \\ -0.155273u^{20} + 0.340820u^{19} + \cdots + 0.219727u - 0.0947266 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} 1 \\ -u^2 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} -0.395996u^{20} + 0.992676u^{19} + \cdots + 0.588379u + 0.591309 \\ 0.114258u^{20} - 0.327148u^{19} + \cdots + 0.583008u - 0.442383 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} -0.340332u^{20} + 0.810059u^{19} + \cdots + 1.36279u + 0.301270 \\ 0.106445u^{20} - 0.0537109u^{19} + \cdots + 0.825195u - 0.684570 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} u \\ 0.0312500u^{20} - 0.0312500u^{19} + \cdots + 0.968750u - 0.0312500 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} -0.281738u^{20} + 0.665527u^{19} + \cdots + 1.17139u + 0.148926 \\ 0.114258u^{20} - 0.327148u^{19} + \cdots + 0.583008u - 0.442383 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} -u \\ u^3 + u \end{pmatrix}$$
$$a_8 = \begin{pmatrix} u^2 + 1 \\ -u^4 - 2u^2 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} -1 \\ 0.0312500u^{20} - 0.0937500u^{19} + \cdots - 0.0312500u + 0.0312500 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} u \\ 0.0312500u^{20} - 0.0312500u^{19} + \cdots + 0.968750u - 0.0312500 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= \frac{9279}{4096}u^{20} - \frac{13821}{4096}u^{19} + \cdots + \frac{13503}{4096}u + \frac{26625}{4096}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_4$ | $u^{21} + 8u^{20} + \cdots + 145u - 16$ |
| $c_2, c_5$ | $u^{21} + 2u^{20} + \cdots + 9u - 4$ |
| $c_3, c_9$ | $u^{21} + 3u^{20} + \cdots - 8u - 32$ |
| $c_6, c_7, c_8$ <br> $c_{10}, c_{11}$ | $u^{21} - 2u^{20} + \cdots + 5u^2 - 1$ |
| $c_{12}$ | $u^{21} + 26u^{20} + \cdots + 10u - 1$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4$ | $y^{21} + 12y^{20} + \cdots + 51681y - 256$ |
| $c_2, c_5$ | $y^{21} + 8y^{20} + \cdots + 145y - 16$ |
| $c_3, c_9$ | $y^{21} - 5y^{20} + \cdots - 4928y - 1024$ |
| $c_6, c_7, c_8$ <br> $c_{10}, c_{11}$ | $y^{21} + 26y^{20} + \cdots + 10y - 1$ |
| $c_{12}$ | $y^{21} - 66y^{20} + \cdots + 126y - 1$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.458142 + 0.833548I$<br>$a = 0.677568 - 0.339414I$<br>$b = -0.773041 + 0.928850I$ | $4.17175 - 1.61049I$ | $8.87690 - 1.72492I$ |
| $u = 0.458142 - 0.833548I$<br>$a = 0.677568 + 0.339414I$<br>$b = -0.773041 - 0.928850I$ | $4.17175 + 1.61049I$ | $8.87690 + 1.72492I$ |
| $u = 0.334381 + 0.773560I$<br>$a = 1.290350 - 0.376146I$<br>$b = -0.805389 - 0.873526I$ | $4.35172 + 4.34513I$ | $10.07573 - 8.03255I$ |
| $u = 0.334381 - 0.773560I$<br>$a = 1.290350 + 0.376146I$<br>$b = -0.805389 + 0.873526I$ | $4.35172 - 4.34513I$ | $10.07573 + 8.03255I$ |
| $u = 1.216790 + 0.212353I$<br>$a = 1.211710 + 0.267891I$<br>$b = -0.377864 - 0.854536I$ | $1.30694 + 1.63824I$ | $-1.29573 + 4.22399I$ |
| $u = 1.216790 - 0.212353I$<br>$a = 1.211710 - 0.267891I$<br>$b = -0.377864 + 0.854536I$ | $1.30694 - 1.63824I$ | $-1.29573 - 4.22399I$ |
| $u = 0.097170 + 0.403788I$<br>$a = 0.57317 + 1.41705I$<br>$b = 0.207107 + 0.829659I$ | $-1.22812 + 1.66803I$ | $2.33962 - 5.96953I$ |
| $u = 0.097170 - 0.403788I$<br>$a = 0.57317 - 1.41705I$<br>$b = 0.207107 - 0.829659I$ | $-1.22812 - 1.66803I$ | $2.33962 + 5.96953I$ |
| $u = 0.381501$<br>$a = 0.337636$<br>$b = 0.264712$ | $0.708376$ | $14.4470$ |
| $u = -0.02913 + 1.62816I$<br>$a = -0.961297 + 0.342959I$<br>$b = 1.038150 - 0.513588I$ | $-10.09800 - 1.80625I$ | $3.06957 + 1.66115I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.02913-1.62816I$<br>$a=-0.961297-0.342959I$<br>$b=\ \ 1.038150+0.513588I$ | $-10.09800+1.80625I$ | $3.06957-1.66115I$ |
| $u=-0.38269+1.61174I$<br>$a=\ \ 0.856171+0.551613I$<br>$b=-1.005420-0.467651I$ | $-10.43370-7.89166I$ | $3.87913+3.10640I$ |
| $u=-0.38269-1.61174I$<br>$a=\ \ 0.856171-0.551613I$<br>$b=-1.005420+0.467651I$ | $-10.43370+7.89166I$ | $3.87913-3.10640I$ |
| $u=\ \ 0.10115+1.67309I$<br>$a=-1.266450+0.124462I$<br>$b=\ \ 0.725547+1.193790I$ | $-12.24280+4.61265I$ | $1.46303-2.55091I$ |
| $u=\ \ 0.10115-1.67309I$<br>$a=-1.266450-0.124462I$<br>$b=\ \ 0.725547-1.193790I$ | $-12.24280-4.61265I$ | $1.46303+2.55091I$ |
| $u=-0.49023+1.63779I$<br>$a=\ \ 1.53317+0.26133I$<br>$b=-0.694270+1.177460I$ | $-12.6524-14.0619I$ | $2.23345+6.95334I$ |
| $u=-0.49023-1.63779I$<br>$a=\ \ 1.53317-0.26133I$<br>$b=-0.694270-1.177460I$ | $-12.6524+14.0619I$ | $2.23345-6.95334I$ |
| $u=-0.265665+0.100260I$<br>$a=-3.22189+1.30088I$<br>$b=\ \ 0.565254-0.857227I$ | $0.38970-2.24826I$ | $1.51589+3.88242I$ |
| $u=-0.265665-0.100260I$<br>$a=-3.22189-1.30088I$<br>$b=\ \ 0.565254+0.857227I$ | $0.38970+2.24826I$ | $1.51589-3.88242I$ |
| $u=-0.23068+1.77893I$<br>$a=-0.111321-0.270180I$<br>$b=-0.012425-1.345530I$ | $-17.3796-4.8017I$ | $-0.50589+2.16688I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.23068 - 1.77893I$<br>$a = -0.111321 + 0.270180I$<br>$b = -0.012425 + 1.345530I$ | $-17.3796 + 4.8017I$ | $-0.50589 - 2.16688I$ |

**II.**

$$\boldsymbol{I_2^u = \langle 2u^7+5u^6+\cdots+7b+1,\ -19u^7-36u^6+\cdots+14a-3,\ u^8+2u^7+\cdots+3u+2\rangle}$$

**(i) Arc colorings**

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

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

$$a_2 = \begin{pmatrix} \frac{19}{14}u^7 + \frac{18}{7}u^6 + \cdots + \frac{19}{2}u + \frac{3}{14} \\ -\frac{2}{7}u^7 - \frac{5}{7}u^6 + \cdots - \frac{15}{7}u - \frac{1}{7} \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} 0.785714u^7 + 1.71429u^6 + \cdots + 8.64286u + 3.64286 \\ -\frac{2}{7}u^7 - \frac{4}{7}u^6 + \cdots - \frac{16}{7}u - \frac{5}{7} \end{pmatrix}$$

$$a_3 = \begin{pmatrix} u^7 + \frac{16}{7}u^6 + \cdots + \frac{75}{7}u + \frac{20}{7} \\ -\frac{2}{7}u^7 - \frac{6}{7}u^6 + \cdots - 3u - \frac{4}{7} \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 0.785714u^7 + 1.57143u^6 + \cdots + 7.78571u + 2.21429 \\ -\frac{2}{7}u^7 - \frac{4}{7}u^6 + \cdots - \frac{16}{7}u - \frac{5}{7} \end{pmatrix}$$

$$a_4 = \begin{pmatrix} \frac{1}{2}u^7 + \frac{8}{7}u^6 + \cdots + \frac{89}{14}u + \frac{41}{14} \\ -\frac{2}{7}u^7 - \frac{4}{7}u^6 + \cdots - \frac{16}{7}u - \frac{5}{7} \end{pmatrix}$$

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

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

$$a_9 = \begin{pmatrix} -\frac{5}{14}u^7 - \frac{3}{7}u^6 + \cdots - \frac{9}{14}u + \frac{31}{14} \\ -\frac{1}{7}u^6 - \frac{2}{7}u^4 + \cdots + \frac{1}{7}u - \frac{3}{7} \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} 0.785714u^7 + 1.57143u^6 + \cdots + 7.78571u + 2.21429 \\ -\frac{3}{7}u^7 - \frac{4}{7}u^6 + \cdots - \frac{5}{7}u - \frac{5}{7} \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= \frac{8}{7}u^7 + \frac{20}{7}u^6 + \frac{44}{7}u^5 + \frac{88}{7}u^4 + \frac{128}{7}u^3 + \frac{96}{7}u^2 + \frac{88}{7}u + \frac{74}{7}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_4$ | $(u^4+2u^3+3u^2+u+1)^2$ |
| $c_2, c_5$ | $(u^4+u^2-u+1)^2$ |
| $c_3, c_9$ | $(u^4+u^2+u+1)^2$ |
| $c_6, c_7, c_8$<br>$c_{10}, c_{11}$ | $u^8+2u^7+5u^6+10u^5+12u^4+12u^3+11u^2+3u+2$ |
| $c_{12}$ | $u^8+6u^7+9u^6-6u^5+6u^4+80u^3+97u^2+35u+4$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4$ | $(y^4 + 2y^3 + 7y^2 + 5y + 1)^2$ |
| $c_2, c_3, c_5$<br>$c_9$ | $(y^4 + 2y^3 + 3y^2 + y + 1)^2$ |
| $c_6, c_7, c_8$<br>$c_{10}, c_{11}$ | $y^8 + 6y^7 + 9y^6 - 6y^5 + 6y^4 + 80y^3 + 97y^2 + 35y + 4$ |
| $c_{12}$ | $y^8 - 18y^7 + \cdots - 449y + 16$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.003353 + 1.153470I$<br>$a = 0.283780 - 0.486090I$<br>$b = 0.547424 + 0.585652I$ | $-2.30977 + 1.39709I$ | $7.77019 - 3.86736I$ |
| $u = 0.003353 - 1.153470I$<br>$a = 0.283780 + 0.486090I$<br>$b = 0.547424 - 0.585652I$ | $-2.30977 - 1.39709I$ | $7.77019 + 3.86736I$ |
| $u = -1.281480 + 0.482756I$<br>$a = 1.44914 - 0.47651I$<br>$b = -0.547424 + 1.120870I$ | $-5.91490 - 7.64338I$ | $2.22981 + 6.51087I$ |
| $u = -1.281480 - 0.482756I$<br>$a = 1.44914 + 0.47651I$<br>$b = -0.547424 - 1.120870I$ | $-5.91490 + 7.64338I$ | $2.22981 - 6.51087I$ |
| $u = -0.046668 + 0.512275I$<br>$a = -2.11815 + 3.03669I$<br>$b = 0.547424 - 0.585652I$ | $-2.30977 - 1.39709I$ | $7.77019 + 3.86736I$ |
| $u = -0.046668 - 0.512275I$<br>$a = -2.11815 - 3.03669I$<br>$b = 0.547424 + 0.585652I$ | $-2.30977 + 1.39709I$ | $7.77019 - 3.86736I$ |
| $u = 0.32480 + 1.70994I$<br>$a = 1.135230 - 0.382122I$<br>$b = -0.547424 - 1.120870I$ | $-5.91490 + 7.64338I$ | $2.22981 - 6.51087I$ |
| $u = 0.32480 - 1.70994I$<br>$a = 1.135230 + 0.382122I$<br>$b = -0.547424 + 1.120870I$ | $-5.91490 - 7.64338I$ | $2.22981 + 6.51087I$ |

**III.** $\boldsymbol{I_3^u = \langle -a^2 + 2au + b + 2a - 2u - 1,\ -3a^3u + 9a^2u + \cdots - 2a + 1,\ u^2 + 1\rangle}$

**(i) Arc colorings**

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

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

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

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

$$a_5 = \begin{pmatrix} a^3 - 2a^2u - 2a^2 + 2au + a + 1 \\ -a^3u + 3a^2u - 3a^2 - au + 6a - u - 4 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} -a^3u + 4a^2u - 2a^2 - 5au + 6a + 3u - 4 \\ a^3u - 3a^2u + 4a^2 - 8a + 2u + 6 \end{pmatrix}$$

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

$$a_4 = \begin{pmatrix} -a^3u + a^3 + a^2u - 5a^2 + au + 7a - u - 3 \\ -a^3u + 3a^2u - 3a^2 - au + 6a - u - 4 \end{pmatrix}$$

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

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

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

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

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

**(iii) Cusp Shapes** $= 4a^3u - 12a^2u + 8a^2 + 12au - 16a - 4u + 12$

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

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

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4$ | $(y^4 + 5y^3 + 7y^2 + 2y + 1)^2$ |
| $c_2, c_5$ | $(y^4 + y^3 + 3y^2 + 2y + 1)^2$ |
| $c_3, c_9$ | $(y^4 - 5y^3 + 7y^2 - 2y + 1)^2$ |
| $c_6, c_7, c_8$ $c_{10}, c_{11}$ | $(y + 1)^8$ |
| $c_{12}$ | $(y - 1)^8$ |

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

| Solutions to $I_3^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.000000I$<br>$a = 0.674360 - 0.399232I$<br>$b = -0.851808 + 0.911292I$ | $3.50087 - 3.16396I$ | $3.82674 + 2.56480I$ |
| $u = 1.000000I$<br>$a = 1.325640 - 0.399232I$<br>$b = -0.851808 - 0.911292I$ | $3.50087 + 3.16396I$ | $3.82674 - 2.56480I$ |
| $u = 1.000000I$<br>$a = 0.59947 + 1.89923I$<br>$b = 0.351808 - 0.720342I$ | $-3.50087 - 1.41510I$ | $0.17326 + 4.90874I$ |
| $u = 1.000000I$<br>$a = 1.40053 + 1.89923I$<br>$b = 0.351808 + 0.720342I$ | $-3.50087 + 1.41510I$ | $0.17326 - 4.90874I$ |
| $u = -1.000000I$<br>$a = 0.674360 + 0.399232I$<br>$b = -0.851808 - 0.911292I$ | $3.50087 + 3.16396I$ | $3.82674 - 2.56480I$ |
| $u = -1.000000I$<br>$a = 1.325640 + 0.399232I$<br>$b = -0.851808 + 0.911292I$ | $3.50087 - 3.16396I$ | $3.82674 + 2.56480I$ |
| $u = -1.000000I$<br>$a = 0.59947 - 1.89923I$<br>$b = 0.351808 + 0.720342I$ | $-3.50087 + 1.41510I$ | $0.17326 - 4.90874I$ |
| $u = -1.000000I$<br>$a = 1.40053 - 1.89923I$<br>$b = 0.351808 - 0.720342I$ | $-3.50087 - 1.41510I$ | $0.17326 + 4.90874I$ |

**IV.** $\boldsymbol{I_4^u = \langle 3642u^{11} + 10715u^{10} + \cdots + 16346b + 454,\ -9302u^{11} + 5482u^{10} + \cdots + 277882a - 125487,\ u^{12} + 3u^{11} + \cdots + 26u + 17\rangle}$

**(i) Arc colorings**

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

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

$$a_2 = \begin{pmatrix} 0.0334746u^{11} - 0.0197278u^{10} + \cdots + 2.00276u + 0.451584 \\ -0.222807u^{11} - 0.655512u^{10} + \cdots - 1.99700u - 0.0277744 \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} 0.128213u^{11} + 0.278557u^{10} + \cdots - 4.21560u - 3.08761 \\ -0.0231249u^{11} - 0.186651u^{10} + \cdots - 0.439557u - 0.366145 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 0.0932842u^{11} + 0.0428527u^{10} + \cdots - 4.81556u - 3.27790 \\ -0.0855255u^{11} - 0.333170u^{10} + \cdots - 1.36376u - 0.854154 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 0.125996u^{11} + 0.290076u^{10} + \cdots + 3.62135u + 1.59297 \\ -0.0671724u^{11} - 0.113606u^{10} + \cdots - 0.562523u - 0.0635630 \end{pmatrix}$$

$$a_4 = \begin{pmatrix} 0.105088u^{11} + 0.0919059u^{10} + \cdots - 4.65516u - 3.45376 \\ -0.0231249u^{11} - 0.186651u^{10} + \cdots - 0.439557u - 0.366145 \end{pmatrix}$$

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

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

$$a_9 = \begin{pmatrix} -0.00373900u^{11} + 0.0559554u^{10} + \cdots + 0.431964u + 1.46531 \\ 0.0879114u^{11} + 0.316714u^{10} + \cdots + 1.68292u + 0.141931 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} 0.125996u^{11} + 0.290076u^{10} + \cdots + 3.62135u + 1.59297 \\ -0.0141931u^{11} - 0.0431298u^{10} + \cdots - 0.706289u - 1.55806 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= \frac{2796}{8173}u^{11} + \frac{10892}{8173}u^{10} + \frac{36956}{8173}u^9 + \frac{76592}{8173}u^8 + \frac{143424}{8173}u^7 + \frac{188928}{8173}u^6 + \frac{226188}{8173}u^5 + \frac{193280}{8173}u^4 + \frac{144560}{8173}u^3 + \frac{67608}{8173}u^2 + \frac{44584}{8173}u + \frac{44270}{8173}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_4$ | $(u^6 + 3u^5 + 4u^4 + 2u^3 + 1)^2$ |
| $c_2, c_5$ | $(u^6 + u^5 + 2u^4 + 2u^3 + 2u^2 + 2u + 1)^2$ |
| $c_3, c_9$ | $(u^6 - u^5 + 2u^4 - 2u^3 + 2u^2 - 2u + 1)^2$ |
| $c_6, c_7, c_8$ $c_{10}, c_{11}$ | $u^{12} + 3u^{11} + \cdots + 26u + 17$ |
| $c_{12}$ | $u^{12} + 13u^{11} + \cdots + 1092u + 289$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4$ | $(y^6 - y^5 + 4y^4 - 2y^3 + 8y^2 + 1)^2$ |
| $c_2, c_3, c_5$ $c_9$ | $(y^6 + 3y^5 + 4y^4 + 2y^3 + 1)^2$ |
| $c_6, c_7, c_8$ $c_{10}, c_{11}$ | $y^{12} + 13y^{11} + \cdots + 1092y + 289$ |
| $c_{12}$ | $y^{12} - 19y^{11} + \cdots - 7564y + 83521$ |

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

| Solutions to $I_4^u$ | $\sqrt{-1}(\text{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.942355 + 0.499238I$<br>$a = 1.51895 + 0.47306I$<br>$b = -0.713912 - 0.305839I$ | $-3.55561 - 2.82812I$ | $5.50976 + 2.97945I$ |
| $u = -0.942355 - 0.499238I$<br>$a = 1.51895 - 0.47306I$<br>$b = -0.713912 + 0.305839I$ | $-3.55561 + 2.82812I$ | $5.50976 - 2.97945I$ |
| $u = 0.343993 + 0.784320I$<br>$a = -3.38338 - 0.25597I$<br>$b = 0.498832 + 1.001300I$ | $-3.55561 + 2.82812I$ | $5.50976 - 2.97945I$ |
| $u = 0.343993 - 0.784320I$<br>$a = -3.38338 + 0.25597I$<br>$b = 0.498832 - 1.001300I$ | $-3.55561 - 2.82812I$ | $5.50976 + 2.97945I$ |
| $u = 0.072139 + 1.221000I$<br>$a = -0.36108 - 1.66788I$<br>$b = 0.498832 - 1.001300I$ | $-3.55561 - 2.82812I$ | $5.50976 + 2.97945I$ |
| $u = 0.072139 - 1.221000I$<br>$a = -0.36108 + 1.66788I$<br>$b = 0.498832 + 1.001300I$ | $-3.55561 + 2.82812I$ | $5.50976 - 2.97945I$ |
| $u = -0.98583 + 1.05129I$<br>$a = 0.337035 + 0.395158I$<br>$b = -0.284920 - 1.115140I$ | $-7.69319$ | $-6 - 1.019511 + 0.10I$ |
| $u = -0.98583 - 1.05129I$<br>$a = 0.337035 - 0.395158I$<br>$b = -0.284920 + 1.115140I$ | $-7.69319$ | $-6 - 1.019511 + 0.10I$ |
| $u = 0.18858 + 1.49820I$<br>$a = 0.690257 - 0.163478I$<br>$b = -0.713912 + 0.305839I$ | $-3.55561 + 2.82812I$ | $5.50976 - 2.97945I$ |
| $u = 0.18858 - 1.49820I$<br>$a = 0.690257 + 0.163478I$<br>$b = -0.713912 - 0.305839I$ | $-3.55561 - 2.82812I$ | $5.50976 + 2.97945I$ |

| Solutions to $I_4^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.17653 + 1.68674I$<br>$a = \quad 0.786457 + 0.514816I$<br>$b = -0.284920 + 1.115140I$ | $-7.69319$ | $-6 - 1.019511 + 0.10I$ |
| $u = -0.17653 - 1.68674I$<br>$a = \quad 0.786457 - 0.514816I$<br>$b = -0.284920 - 1.115140I$ | $-7.69319$ | $-6 - 1.019511 + 0.10I$ |

## V. $\boldsymbol{I_5^u = \langle b + 2a + 2,\ 4a^2 + 10a + 7,\ u + 1\rangle}$

**(i) Arc colorings**

$$a_6 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} a \\ -2a-2 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} 3a+\frac{9}{2} \\ -2a-3 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} a+\frac{3}{2} \\ -2a-3 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} a+\frac{3}{2} \\ -2a-3 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= \frac{31}{2}a + \frac{59}{2}$

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

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

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

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

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

| Solutions to $I_5^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.00000$<br>$a = -1.250000 + 0.433013I$<br>$b = \phantom{-}0.500000 - 0.866025I$ | $1.64493 - 2.02988I$ | $10.12500 + 6.71170I$ |
| $u = -1.00000$<br>$a = -1.250000 - 0.433013I$<br>$b = \phantom{-}0.500000 + 0.866025I$ | $1.64493 + 2.02988I$ | $10.12500 - 6.71170I$ |

## VI. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_4$ | $(u^2-u+1)(u^4-u^3+3u^2-2u+1)^2(u^4+2u^3+3u^2+u+1)^2$ $\cdot((u^6+3u^5+4u^4+2u^3+1)^2)(u^{21}+8u^{20}+\cdots+145u-16)$ |
| $c_2$ | $(u^2+u+1)(u^4+u^2-u+1)^2(u^4-u^3+u^2+1)^2$ $\cdot((u^6+u^5+2u^4+2u^3+2u^2+2u+1)^2)(u^{21}+2u^{20}+\cdots+9u-4)$ |
| $c_3, c_9$ | $u^2(u^4+u^2+u+1)^2(u^6-u^5+2u^4-2u^3+2u^2-2u+1)^2$ $\cdot(u^8-5u^6+7u^4-2u^2+1)(u^{21}+3u^{20}+\cdots-8u-32)$ |
| $c_5$ | $(u^2-u+1)(u^4+u^2-u+1)^2(u^4+u^3+u^2+1)^2$ $\cdot((u^6+u^5+2u^4+2u^3+2u^2+2u+1)^2)(u^{21}+2u^{20}+\cdots+9u-4)$ |
| $c_6, c_7, c_8$ | $(u+1)^2(u^2+1)^4$ $\cdot(u^8+2u^7+5u^6+10u^5+12u^4+12u^3+11u^2+3u+2)$ $\cdot(u^{12}+3u^{11}+\cdots+26u+17)(u^{21}-2u^{20}+\cdots+5u^2-1)$ |
| $c_{10}, c_{11}$ | $(u-1)^2(u^2+1)^4$ $\cdot(u^8+2u^7+5u^6+10u^5+12u^4+12u^3+11u^2+3u+2)$ $\cdot(u^{12}+3u^{11}+\cdots+26u+17)(u^{21}-2u^{20}+\cdots+5u^2-1)$ |
| $c_{12}$ | $((u-1)^2)(u+1)^8(u^8+6u^7+\cdots+35u+4)$ $\cdot(u^{12}+13u^{11}+\cdots+1092u+289)(u^{21}+26u^{20}+\cdots+10u-1)$ |

## VII. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4$ | $(y^2+y+1)(y^4+2y^3+7y^2+5y+1)^2(y^4+5y^3+7y^2+2y+1)^2$ $\cdot((y^6-y^5+4y^4-2y^3+8y^2+1)^2)(y^{21}+12y^{20}+\cdots+51681y-256)$ |
| $c_2, c_5$ | $(y^2+y+1)(y^4+y^3+3y^2+2y+1)^2(y^4+2y^3+3y^2+y+1)^2$ $\cdot((y^6+3y^5+4y^4+2y^3+1)^2)(y^{21}+8y^{20}+\cdots+145y-16)$ |
| $c_3, c_9$ | $y^2(y^4-5y^3+7y^2-2y+1)^2(y^4+2y^3+3y^2+y+1)^2$ $\cdot((y^6+3y^5+4y^4+2y^3+1)^2)(y^{21}-5y^{20}+\cdots-4928y-1024)$ |
| $c_6, c_7, c_8$ $c_{10}, c_{11}$ | $((y-1)^2)(y+1)^8(y^8+6y^7+\cdots+35y+4)$ $\cdot(y^{12}+13y^{11}+\cdots+1092y+289)(y^{21}+26y^{20}+\cdots+10y-1)$ |
| $c_{12}$ | $((y-1)^{10})(y^8-18y^7+\cdots-449y+16)$ $\cdot(y^{12}-19y^{11}+\cdots-7564y+83521)(y^{21}-66y^{20}+\cdots+126y-1)$ |