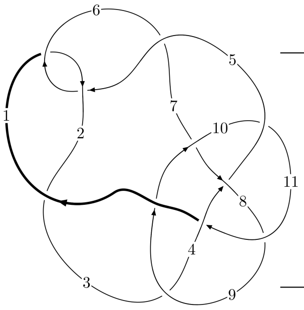
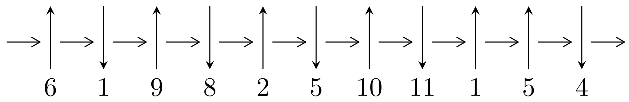
## $11n_{123}$ ($K11n_{123}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$I_1^u = \langle -2418u^{15} - 2313u^{14} + \cdots + 1243b - 778,\ -8755u^{15} - 9533u^{14} + \cdots + 1243a - 8595,$$
$$u^{16} + u^{15} + 5u^{14} + 3u^{13} + 16u^{12} + 7u^{11} + 34u^{10} + 8u^9 + 46u^8 - 3u^7 + 40u^6 - 10u^5 + 24u^4 - 3u^3 + 8u^2 + 1\rangle$$
$$I_2^u = \langle 613651112649u^{21} + 1301363271193u^{20} + \cdots + 2238186198787b + 596588806112,$$
$$- 1570251208513u^{21} - 3146564850505u^{20} + \cdots + 2238186198787a - 6111907356770,$$
$$u^{22} + 2u^{21} + \cdots + 3u + 1\rangle$$
$$I_3^u = \langle -u^5 + u^4 - 2u^3 + u^2 + b - u,\ -2u^5 + 2u^4 - 3u^3 + u^2 + a - 1,\ u^6 - u^5 + 2u^4 - u^3 + u^2 + 1\rangle$$
$$I_4^u = \langle -u^3 + u^2 + b - 3u + 1,\ a,\ u^4 - u^3 + 3u^2 - u + 1\rangle$$

* 4 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 48 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.** $\boldsymbol{I_1^u = \langle -2418u^{15} - 2313u^{14} + \cdots + 1243b - 778,\ -8755u^{15} - 9533u^{14} + \cdots + 1243a - 8595,\ u^{16} + u^{15} + \cdots + 8u^2 + 1\rangle}$

**(i) Arc colorings**

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

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

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

$$a_{11} = \begin{pmatrix} 7.04344u^{15} + 7.66935u^{14} + \cdots + 21.9067u + 6.91472 \\ 1.94529u^{15} + 1.86082u^{14} + \cdots + 8.04344u + 0.625905 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 7.04344u^{15} + 7.66935u^{14} + \cdots + 20.9067u + 6.91472 \\ 1.94529u^{15} + 1.86082u^{14} + \cdots + 8.04344u + 0.625905 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} 5.09815u^{15} + 5.80853u^{14} + \cdots + 13.8632u + 6.28882 \\ 1.94529u^{15} + 1.86082u^{14} + \cdots + 8.04344u + 0.625905 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -3.95414u^{15} - 0.515688u^{14} + \cdots - 25.6541u + 11.7989 \\ 2.08367u^{15} + 2.91874u^{14} + \cdots + 4.22767u + 4.98391 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} -1.87047u^{15} + 2.40306u^{14} + \cdots - 21.4264u + 16.7828 \\ 2.08367u^{15} + 2.91874u^{14} + \cdots + 4.22767u + 4.98391 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} -4.35800u^{15} - 4.21963u^{14} + \cdots - 16.1569u - 4.81577 \\ -0.679002u^{15} + 0.390185u^{14} + \cdots - 5.57844u + 3.59212 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} -12.5093u^{15} - 14.9574u^{14} + \cdots - 35.6838u - 21.5559 \\ -4.06436u^{15} - 2.39903u^{14} + \cdots - 18.7136u + 3.08930 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} 1.72164u^{15} + 6.67418u^{14} + \cdots - 13.6613u + 22.3612 \\ 3.59212u^{15} + 4.27112u^{14} + \cdots + 9.76508u + 5.57844 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} 1.72164u^{15} + 6.67418u^{14} + \cdots - 13.6613u + 22.3612 \\ 3.59212u^{15} + 4.27112u^{14} + \cdots + 9.76508u + 5.57844 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -\frac{7257}{1243}u^{15} - \frac{4223}{1243}u^{14} + \cdots - \frac{16867}{1243}u + \frac{8997}{1243}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $u^{16} - 5u^{15} + \cdots - 25u + 4$ |
| $c_2, c_6$ | $u^{16} + 11u^{15} + \cdots + 15u + 16$ |
| $c_3, c_{10}$ | $u^{16} + 8u^{14} + \cdots - u + 1$ |
| $c_4, c_{11}$ | $u^{16} - u^{15} + \cdots + 8u^2 + 1$ |
| $c_7, c_9$ | $u^{16} - 2u^{15} + \cdots - 5u + 1$ |
| $c_8$ | $u^{16} - 11u^{15} + \cdots - 9u + 2$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $y^{16} + 11y^{15} + \cdots + 15y + 16$ |
| $c_2, c_6$ | $y^{16} - 9y^{15} + \cdots + 3679y + 256$ |
| $c_3, c_{10}$ | $y^{16} + 16y^{15} + \cdots + 13y + 1$ |
| $c_4, c_{11}$ | $y^{16} + 9y^{15} + \cdots + 16y + 1$ |
| $c_7, c_9$ | $y^{16} + 20y^{15} + \cdots + 89y + 1$ |
| $c_8$ | $y^{16} - 9y^{15} + \cdots + 67y + 4$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.182868 + 1.082360I$<br>$a = -0.245163 + 0.184305I$<br>$b = -0.534837 + 1.195060I$ | $0.087550 - 0.115204I$ | $2.02768 - 0.43913I$ |
| $u = -0.182868 - 1.082360I$<br>$a = -0.245163 - 0.184305I$<br>$b = -0.534837 - 1.195060I$ | $0.087550 + 0.115204I$ | $2.02768 + 0.43913I$ |
| $u = 0.153974 + 1.184900I$<br>$a = 0.067583 - 1.055900I$<br>$b = -0.138027 - 0.297204I$ | $4.72589 - 3.00353I$ | $9.61260 + 1.22526I$ |
| $u = 0.153974 - 1.184900I$<br>$a = 0.067583 + 1.055900I$<br>$b = -0.138027 + 0.297204I$ | $4.72589 + 3.00353I$ | $9.61260 - 1.22526I$ |
| $u = 0.571189 + 0.516899I$<br>$a = 0.465400 + 0.095953I$<br>$b = 0.600357 + 0.236415I$ | $-0.30256 - 1.83448I$ | $0.83977 + 3.70409I$ |
| $u = 0.571189 - 0.516899I$<br>$a = 0.465400 - 0.095953I$<br>$b = 0.600357 - 0.236415I$ | $-0.30256 + 1.83448I$ | $0.83977 - 3.70409I$ |
| $u = -0.025357 + 0.613269I$<br>$a = -1.140780 + 0.093929I$<br>$b = -0.456590 + 0.613056I$ | $0.807041 - 1.112270I$ | $4.93277 + 4.22512I$ |
| $u = -0.025357 - 0.613269I$<br>$a = -1.140780 - 0.093929I$<br>$b = -0.456590 - 0.613056I$ | $0.807041 + 1.112270I$ | $4.93277 - 4.22512I$ |
| $u = -0.87363 + 1.12508I$<br>$a = -1.102560 - 0.750912I$<br>$b = 0.04840 - 1.41972I$ | $-9.63409 + 1.32861I$ | $-2.22452 - 1.49647I$ |
| $u = -0.87363 - 1.12508I$<br>$a = -1.102560 + 0.750912I$<br>$b = 0.04840 + 1.41972I$ | $-9.63409 - 1.32861I$ | $-2.22452 + 1.49647I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.93365 + 1.17761I$<br>$a = 1.064180 - 0.515654I$<br>$b = 0.34787 - 1.42806I$ | $-5.07602 - 7.48555I$ | $0.37702 + 4.74920I$ |
| $u = 0.93365 - 1.17761I$<br>$a = 1.064180 + 0.515654I$<br>$b = 0.34787 + 1.42806I$ | $-5.07602 + 7.48555I$ | $0.37702 - 4.74920I$ |
| $u = -0.101130 + 0.483106I$<br>$a = 4.05859 + 0.78880I$<br>$b = 0.727529 + 1.055710I$ | $-4.12337 + 3.39887I$ | $1.84182 + 0.78536I$ |
| $u = -0.101130 - 0.483106I$<br>$a = 4.05859 - 0.78880I$<br>$b = 0.727529 - 1.055710I$ | $-4.12337 - 3.39887I$ | $1.84182 - 0.78536I$ |
| $u = -0.97583 + 1.17333I$<br>$a = -1.167260 - 0.382800I$<br>$b = -0.59470 - 1.66211I$ | $-9.5135 + 13.5240I$ | $-1.40716 - 7.09485I$ |
| $u = -0.97583 - 1.17333I$<br>$a = -1.167260 + 0.382800I$<br>$b = -0.59470 + 1.66211I$ | $-9.5135 - 13.5240I$ | $-1.40716 + 7.09485I$ |

**II.**
$\boldsymbol{I_2^u = \langle 6.14\times10^{11}u^{21}+1.30\times10^{12}u^{20}+\cdots+2.24\times10^{12}b+5.97\times10^{11},\ -1.57\times10^{12}u^{21}-3.15\times10^{12}u^{20}+\cdots+2.24\times10^{12}a-6.11\times10^{12},\ u^{22}+2u^{21}+\cdots+3u+1\rangle}$

**(i) Arc colorings**

$$a_5 = \begin{pmatrix}1\\0\end{pmatrix}$$
$$a_8 = \begin{pmatrix}0\\u\end{pmatrix}$$
$$a_4 = \begin{pmatrix}1\\-u^2\end{pmatrix}$$
$$a_{11} = \begin{pmatrix}0.701573u^{21}+1.40585u^{20}+\cdots+9.05835u+2.73074\\-0.274173u^{21}-0.581437u^{20}+\cdots-5.23195u-0.266550\end{pmatrix}$$
$$a_1 = \begin{pmatrix}u^{21}+2u^{20}+\cdots+15u+3\\-0.298427u^{21}-0.594145u^{20}+\cdots-4.94165u-0.269259\end{pmatrix}$$
$$a_{10} = \begin{pmatrix}0.975746u^{21}+1.98729u^{20}+\cdots+14.2903u+2.99729\\-0.274173u^{21}-0.581437u^{20}+\cdots-5.23195u-0.266550\end{pmatrix}$$
$$a_7 = \begin{pmatrix}0.959986u^{21}+1.89743u^{20}+\cdots+13.7253u+3.00284\\-0.378333u^{21}-0.739672u^{20}+\cdots-4.23796u-0.332002\end{pmatrix}$$
$$a_6 = \begin{pmatrix}0.581652u^{21}+1.15776u^{20}+\cdots+9.48733u+2.67084\\-0.378333u^{21}-0.739672u^{20}+\cdots-4.23796u-0.332002\end{pmatrix}$$
$$a_2 = \begin{pmatrix}0.119474u^{21}+0.251847u^{20}+\cdots+4.26741u+2.58228\\-0.0953666u^{21}-0.241791u^{20}+\cdots-3.21559u-0.997831\end{pmatrix}$$
$$a_3 = \begin{pmatrix}0.451476u^{21}+0.537517u^{20}+\cdots+7.60383u-0.659673\\0.0178553u^{21}+0.0471570u^{20}+\cdots-1.48034u+0.254377\end{pmatrix}$$
$$a_9 = \begin{pmatrix}0.391301u^{21}+0.842507u^{20}+\cdots+4.87766u+2.29577\\-0.190351u^{21}-0.315251u^{20}+\cdots-2.60967u-0.375067\end{pmatrix}$$
$$a_9 = \begin{pmatrix}0.391301u^{21}+0.842507u^{20}+\cdots+4.87766u+2.29577\\-0.190351u^{21}-0.315251u^{20}+\cdots-2.60967u-0.375067\end{pmatrix}$$

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

**(iii) Cusp Shapes**
$= -\frac{2340479983939}{2238186198787}u^{21} - \frac{5426028325222}{2238186198787}u^{20} + \cdots - \frac{64839493010449}{2238186198787}u - \frac{12900652043582}{2238186198787}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $(u^{11} + 2u^{10} + \cdots + 4u + 1)^2$ |
| $c_2, c_6$ | $(u^{11} + 8u^{10} + \cdots - 18u^2 - 1)^2$ |
| $c_3, c_{10}$ | $u^{22} + 10u^{20} + \cdots + 265u + 47$ |
| $c_4, c_{11}$ | $u^{22} - 2u^{21} + \cdots - 3u + 1$ |
| $c_7, c_9$ | $u^{22} + 5u^{21} + \cdots - 94u + 53$ |
| $c_8$ | $(u^{11} + 5u^{10} + \cdots - 10u - 4)^2$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $(y^{11} + 8y^{10} + \cdots - 18y^2 - 1)^2$ |
| $c_2, c_6$ | $(y^{11} - 8y^{10} + \cdots - 36y - 1)^2$ |
| $c_3, c_{10}$ | $y^{22} + 20y^{21} + \cdots - 5647y + 2209$ |
| $c_4, c_{11}$ | $y^{22} + 12y^{20} + \cdots + 21y + 1$ |
| $c_7, c_9$ | $y^{22} + 23y^{21} + \cdots - 34700y + 2809$ |
| $c_8$ | $(y^{11} - 5y^{10} + \cdots + 108y - 16)^2$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.459600 + 0.859618I$<br>$a = -1.56146 + 0.19719I$<br>$b = -1.74595 + 0.63036I$ | $-2.74251 - 5.63735I$ | $-0.48609 + 8.17754I$ |
| $u = 0.459600 - 0.859618I$<br>$a = -1.56146 - 0.19719I$<br>$b = -1.74595 - 0.63036I$ | $-2.74251 + 5.63735I$ | $-0.48609 - 8.17754I$ |
| $u = -0.670381 + 0.843079I$<br>$a = 1.36153 + 0.63867I$<br>$b = 0.41764 + 1.61796I$ | $-5.00595 + 2.60776I$ | $-5.49826 - 2.04245I$ |
| $u = -0.670381 - 0.843079I$<br>$a = 1.36153 - 0.63867I$<br>$b = 0.41764 - 1.61796I$ | $-5.00595 - 2.60776I$ | $-5.49826 + 2.04245I$ |
| $u = 0.783710 + 0.088000I$<br>$a = -1.93047 - 0.70159I$<br>$b = 0.403600 - 0.151320I$ | $-5.00595 - 2.60776I$ | $-5.49826 + 2.04245I$ |
| $u = 0.783710 - 0.088000I$<br>$a = -1.93047 + 0.70159I$<br>$b = 0.403600 + 0.151320I$ | $-5.00595 + 2.60776I$ | $-5.49826 - 2.04245I$ |
| $u = 0.816160 + 0.913545I$<br>$a = -1.019150 + 0.057227I$<br>$b = -0.561626 + 0.977866I$ | $-0.25878 - 3.13682I$ | $5.62912 + 1.87495I$ |
| $u = 0.816160 - 0.913545I$<br>$a = -1.019150 - 0.057227I$<br>$b = -0.561626 - 0.977866I$ | $-0.25878 + 3.13682I$ | $5.62912 - 1.87495I$ |
| $u = -0.475290 + 0.551526I$<br>$a = 1.71279 + 0.12691I$<br>$b = 0.883704 - 0.005644I$ | $-0.25878 + 3.13682I$ | $5.62912 - 1.87495I$ |
| $u = -0.475290 - 0.551526I$<br>$a = 1.71279 - 0.12691I$<br>$b = 0.883704 + 0.005644I$ | $-0.25878 - 3.13682I$ | $5.62912 + 1.87495I$ |

| Solutions to $I^u_2$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.077760 + 0.707508I$<br>$a = 1.108020 - 0.433957I$<br>$b = 0.389001 + 1.117020I$ | $-2.74251 + 5.63735I$ | $-0.48609 - 8.17754I$ |
| $u = -1.077760 - 0.707508I$<br>$a = 1.108020 + 0.433957I$<br>$b = 0.389001 - 1.117020I$ | $-2.74251 - 5.63735I$ | $-0.48609 + 8.17754I$ |
| $u = -1.011520 + 0.825413I$<br>$a = -0.633146 - 0.377582I$<br>$b = -0.37963 - 1.79002I$ | $-10.59450 + 5.64581I$ | $-3.10897 - 3.66343I$ |
| $u = -1.011520 - 0.825413I$<br>$a = -0.633146 + 0.377582I$<br>$b = -0.37963 + 1.79002I$ | $-10.59450 - 5.64581I$ | $-3.10897 + 3.66343I$ |
| $u = 1.133190 + 0.778692I$<br>$a = 0.533769 - 0.366790I$<br>$b = 0.12411 - 1.47210I$ | $-6.33840$ | $-6 - 1.167441 + 0.10I$ |
| $u = 1.133190 - 0.778692I$<br>$a = 0.533769 + 0.366790I$<br>$b = 0.12411 + 1.47210I$ | $-6.33840$ | $-6 - 1.167441 + 0.10I$ |
| $u = 0.35734 + 1.44486I$<br>$a = -0.249751 + 0.405356I$<br>$b = -0.159367 + 0.805498I$ | $1.20928 - 2.43685I$ | $-2.45208 + 7.14380I$ |
| $u = 0.35734 - 1.44486I$<br>$a = -0.249751 - 0.405356I$<br>$b = -0.159367 - 0.805498I$ | $1.20928 + 2.43685I$ | $-2.45208 - 7.14380I$ |
| $u = -1.22659 + 0.86184I$<br>$a = -0.465716 - 0.441913I$<br>$b = 0.27756 - 1.47343I$ | $-10.59450 - 5.64581I$ | $-3.10897 + 3.66343I$ |
| $u = -1.22659 - 0.86184I$<br>$a = -0.465716 + 0.441913I$<br>$b = 0.27756 + 1.47343I$ | $-10.59450 + 5.64581I$ | $-3.10897 - 3.66343I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.088447 + 0.246861I$<br>$a = 1.64359 + 2.14516I$<br>$b = 0.350965 - 1.259140I$ | $1.20928 + 2.43685I$ | $-2.45208 - 7.14380I$ |
| $u = -0.088447 - 0.246861I$<br>$a = 1.64359 - 2.14516I$<br>$b = 0.350965 + 1.259140I$ | $1.20928 - 2.43685I$ | $-2.45208 + 7.14380I$ |

**III.** $\boldsymbol{I_3^u = \langle -u^5+u^4-2u^3+u^2+b-u,\ -2u^5+2u^4-3u^3+u^2+a-1,\ u^6-u^5+2u^4-u^3+u^2+1\rangle}$

**(i) Arc colorings**

$$a_5 = \begin{pmatrix}1\\0\end{pmatrix}$$
$$a_8 = \begin{pmatrix}0\\u\end{pmatrix}$$
$$a_4 = \begin{pmatrix}1\\-u^2\end{pmatrix}$$
$$a_{11} = \begin{pmatrix}2u^5-2u^4+3u^3-u^2+1\\u^5-u^4+2u^3-u^2+u\end{pmatrix}$$
$$a_1 = \begin{pmatrix}2u^5-2u^4+3u^3-u^2+u+1\\u^5-u^4+u^3-u^2+u\end{pmatrix}$$
$$a_{10} = \begin{pmatrix}u^5-u^4+u^3-u+1\\u^5-u^4+2u^3-u^2+u\end{pmatrix}$$
$$a_7 = \begin{pmatrix}-u^5+2u^4-4u^3+4u^2-3u+1\\u^5-u^4+u^3+1\end{pmatrix}$$
$$a_6 = \begin{pmatrix}u^4-3u^3+4u^2-3u+2\\u^5-u^4+u^3+1\end{pmatrix}$$
$$a_2 = \begin{pmatrix}-u^5+u^4-2u^3+u^2-2\\-u^3+u^2-u\end{pmatrix}$$
$$a_3 = \begin{pmatrix}-3u^5+5u^4-7u^3+3u^2-3\\-u^5+3u^4-4u^3+3u^2-2u+1\end{pmatrix}$$
$$a_9 = \begin{pmatrix}2u^5-u^4+3u^2-4u+3\\2u^5-2u^4+3u^3-u^2+u+1\end{pmatrix}$$
$$a_9 = \begin{pmatrix}2u^5-u^4+3u^2-4u+3\\2u^5-2u^4+3u^3-u^2+u+1\end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 6u^4-7u^3+12u^2-4u+2$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^6 - 2u^5 + 4u^4 - 4u^3 + 4u^2 - u + 1$ |
| $c_2, c_6$ | $u^6 + 4u^5 + 8u^4 + 14u^3 + 16u^2 + 7u + 1$ |
| $c_3, c_{10}$ | $u^6 + u^4 - u^3 + 2u^2 - u + 1$ |
| $c_4, c_{11}$ | $u^6 - u^5 + 2u^4 - u^3 + u^2 + 1$ |
| $c_5$ | $u^6 + 2u^5 + 4u^4 + 4u^3 + 4u^2 + u + 1$ |
| $c_7, c_9$ | $u^6 - 2u^5 + 5u^4 - 5u^3 + 4u^2 - 3u + 1$ |
| $c_8$ | $u^6 - 8u^5 + 30u^4 - 65u^3 + 84u^2 - 62u + 21$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $y^6 + 4y^5 + 8y^4 + 14y^3 + 16y^2 + 7y + 1$ |
| $c_2, c_6$ | $y^6 - 16y^4 + 6y^3 + 76y^2 - 17y + 1$ |
| $c_3, c_{10}$ | $y^6 + 2y^5 + 5y^4 + 5y^3 + 4y^2 + 3y + 1$ |
| $c_4, c_{11}$ | $y^6 + 3y^5 + 4y^4 + 5y^3 + 5y^2 + 2y + 1$ |
| $c_7, c_9$ | $y^6 + 6y^5 + 13y^4 + 5y^3 - 4y^2 - y + 1$ |
| $c_8$ | $y^6 - 4y^5 + 28y^4 - 135y^3 + 256y^2 - 316y + 441$ |

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

| Solutions to $I_3^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.800501 + 0.710292I$<br>$a = -1.163950 - 0.050182I$<br>$b = -0.698934 + 0.620170I$ | $-1.27956 - 3.69612I$ | $-2.32375 + 5.61497I$ |
| $u = 0.800501 - 0.710292I$<br>$a = -1.163950 + 0.050182I$<br>$b = -0.698934 - 0.620170I$ | $-1.27956 + 3.69612I$ | $-2.32375 - 5.61497I$ |
| $u = 0.155981 + 1.227730I$<br>$a = -0.297083 + 1.291660I$<br>$b = -0.101839 + 0.801573I$ | $3.99825 - 3.41127I$ | $0.80640 + 5.19600I$ |
| $u = 0.155981 - 1.227730I$<br>$a = -0.297083 - 1.291660I$<br>$b = -0.101839 - 0.801573I$ | $3.99825 + 3.41127I$ | $0.80640 - 5.19600I$ |
| $u = -0.456483 + 0.601395I$<br>$a = 2.96104 + 0.19968I$<br>$b = 0.800773 + 1.054980I$ | $-4.36362 + 4.05299I$ | $-2.48265 - 9.09326I$ |
| $u = -0.456483 - 0.601395I$<br>$a = 2.96104 - 0.19968I$<br>$b = 0.800773 - 1.054980I$ | $-4.36362 - 4.05299I$ | $-2.48265 + 9.09326I$ |

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

**(i) Arc colorings**

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

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

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

$$a_{11} = \begin{pmatrix} 0 \\ u^3 - u^2 + 3u - 1 \end{pmatrix}$$

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

$$a_{10} = \begin{pmatrix} -u^3 + u^2 - 3u + 1 \\ u^3 - u^2 + 3u - 1 \end{pmatrix}$$

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

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

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

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

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

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

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

**(iii) Cusp Shapes** $= u^3 - u^2 + 2u + 7$

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

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

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_2, c_5$ $c_6$ | $(y^2 + y + 1)^2$ |
| $c_3, c_4, c_{10}$ $c_{11}$ | $y^4 + 5y^3 + 9y^2 + 5y + 1$ |
| $c_7, c_9$ | $(y - 1)^4$ |
| $c_8$ | $y^4$ |

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

| Solutions to $I_4^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.148403 + 0.632502I$<br>$a = 0$<br>$b = -0.35160 + 1.49853I$ | $1.64493 + 2.02988I$ | $7.50000 + 0.86603I$ |
| $u = 0.148403 - 0.632502I$<br>$a = 0$<br>$b = -0.35160 - 1.49853I$ | $1.64493 - 2.02988I$ | $7.50000 - 0.86603I$ |
| $u = 0.35160 + 1.49853I$<br>$a = 0$<br>$b = -0.148403 + 0.632502I$ | $1.64493 - 2.02988I$ | $7.50000 - 0.86603I$ |
| $u = 0.35160 - 1.49853I$<br>$a = 0$<br>$b = -0.148403 - 0.632502I$ | $1.64493 + 2.02988I$ | $7.50000 + 0.86603I$ |

## V. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $(u^2+u+1)^2(u^6-2u^5+4u^4-4u^3+4u^2-u+1)$ $\cdot((u^{11}+2u^{10}+\cdots+4u+1)^2)(u^{16}-5u^{15}+\cdots-25u+4)$ |
| $c_2, c_6$ | $(u^2+u+1)^2(u^6+4u^5+8u^4+14u^3+16u^2+7u+1)$ $\cdot((u^{11}+8u^{10}+\cdots-18u^2-1)^2)(u^{16}+11u^{15}+\cdots+15u+16)$ |
| $c_3, c_{10}$ | $(u^4-u^3+3u^2-u+1)(u^6+u^4-u^3+2u^2-u+1)$ $\cdot(u^{16}+8u^{14}+\cdots-u+1)(u^{22}+10u^{20}+\cdots+265u+47)$ |
| $c_4, c_{11}$ | $(u^4-u^3+3u^2-u+1)(u^6-u^5+2u^4-u^3+u^2+1)$ $\cdot(u^{16}-u^{15}+\cdots+8u^2+1)(u^{22}-2u^{21}+\cdots-3u+1)$ |
| $c_5$ | $(u^2-u+1)^2(u^6+2u^5+4u^4+4u^3+4u^2+u+1)$ $\cdot((u^{11}+2u^{10}+\cdots+4u+1)^2)(u^{16}-5u^{15}+\cdots-25u+4)$ |
| $c_7, c_9$ | $(u+1)^4(u^6-2u^5+5u^4-5u^3+4u^2-3u+1)$ $\cdot(u^{16}-2u^{15}+\cdots-5u+1)(u^{22}+5u^{21}+\cdots-94u+53)$ |
| $c_8$ | $u^4(u^6-8u^5+30u^4-65u^3+84u^2-62u+21)$ $\cdot((u^{11}+5u^{10}+\cdots-10u-4)^2)(u^{16}-11u^{15}+\cdots-9u+2)$ |

**VI. Riley Polynomials**

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $(y^2+y+1)^2(y^6+4y^5+8y^4+14y^3+16y^2+7y+1)$ $\cdot((y^{11}+8y^{10}+\cdots-18y^2-1)^2)(y^{16}+11y^{15}+\cdots+15y+16)$ |
| $c_2, c_6$ | $(y^2+y+1)^2(y^6-16y^4+6y^3+76y^2-17y+1)$ $\cdot((y^{11}-8y^{10}+\cdots-36y-1)^2)(y^{16}-9y^{15}+\cdots+3679y+256)$ |
| $c_3, c_{10}$ | $(y^4+5y^3+9y^2+5y+1)(y^6+2y^5+5y^4+5y^3+4y^2+3y+1)$ $\cdot(y^{16}+16y^{15}+\cdots+13y+1)(y^{22}+20y^{21}+\cdots-5647y+2209)$ |
| $c_4, c_{11}$ | $(y^4+5y^3+9y^2+5y+1)(y^6+3y^5+4y^4+5y^3+5y^2+2y+1)$ $\cdot(y^{16}+9y^{15}+\cdots+16y+1)(y^{22}+12y^{20}+\cdots+21y+1)$ |
| $c_7, c_9$ | $(y-1)^4(y^6+6y^5+13y^4+5y^3-4y^2-y+1)$ $\cdot(y^{16}+20y^{15}+\cdots+89y+1)(y^{22}+23y^{21}+\cdots-34700y+2809)$ |
| $c_8$ | $y^4(y^6-4y^5+28y^4-135y^3+256y^2-316y+441)$ $\cdot((y^{11}-5y^{10}+\cdots+108y-16)^2)(y^{16}-9y^{15}+\cdots+67y+4)$ |