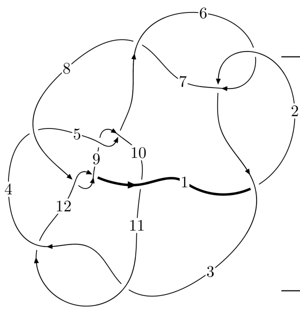
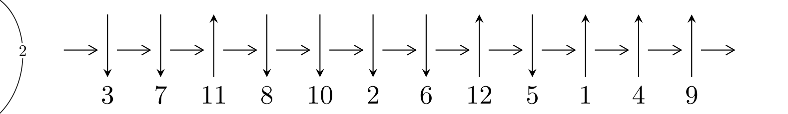
# $12a_{0668}$ ($K12a_{0668}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$I^u_1 = \langle -192u^{76} - 372u^{75} + \cdots + 2304b + 776,\ -4833u^{76} - 10270u^{75} + \cdots + 52992a + 144168,\ u^{77} + 4u^{76} + \cdots - 32u + 46\rangle$$
$$I^u_2 = \langle b + 1,\ -u^3 - 8u^2 + 10a - 2u + 14,\ u^4 - 2u^2 + 2\rangle$$
$$I^u_3 = \langle -6a^2u^2 + 7a^2u - u^2a + 2a^2 - 2au + 2u^2 + 19b + 13a + 4u + 12,\ a^3 + 2a^2u - 2a^2 + au + u^2 + a - u - 2,\ u^3 - u^2 + 1\rangle$$
$$I^u_4 = \langle -b^2u^2a + b^2au + b^3 + u^2b + u^2a - bu - au - u^2 - b + u - 1,\ u^3 - u^2 + 1\rangle$$

$$I^v_1 = \langle a,\ b^3 - b + 1,\ v - 1\rangle$$
$$I^v_2 = \langle a,\ b - 1,\ v - 1\rangle$$

* 5 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 94 representations.
* 1 irreducible components of $\dim_{\mathbb{C}} = 1$

[1] The image of knot diagram is generated by the software "**Draw programme**" developed by Andrew Bartholomew(`http://www.layer8.co.uk/maths/draw/index.htm#Running-draw`), where we modified some parts for our purpose(`https://github.com/CATsTAILs/LinksPainter`).

[2] All coefficients of polynomials are rational numbers. But the coefficients are sometimes approximated in decimal forms when there is not enough margin.

**I.** $\boldsymbol{I_1^u = \langle -192u^{76} - 372u^{75} + \cdots + 2304b + 776,\ -4833u^{76} - 10270u^{75} + \cdots + 52992a + 144168,\ u^{77} + 4u^{76} + \cdots - 32u + 46\rangle}$

**(i) Arc colorings**

$$a_2 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_6 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} -u \\ -u^3 + u \end{pmatrix}$$
$$a_8 = \begin{pmatrix} -u^2 + 1 \\ u^2 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} u^3 \\ u^5 - u^3 + u \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} 0.0912024u^{76} + 0.193803u^{75} + \cdots + 0.310198u - 2.72056 \\ 0.0833333u^{76} + 0.161458u^{75} + \cdots + 3.90538u - 0.336806 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} -0.256454u^{76} - 0.885624u^{75} + \cdots + 7.09666u - 12.3039 \\ 0.375000u^{76} + 0.894531u^{75} + \cdots + 9.90799u + 2.05903 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} -0.0515172u^{76} - 0.0498188u^{75} + \cdots - 4.84681u + 4.73970 \\ -0.00520833u^{76} - 0.0716146u^{75} + \cdots + 3.14583u - 1.83073 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} 0.0448370u^{76} + 0.127264u^{75} + \cdots + 1.43965u + 2.90897 \\ 0.0234375u^{76} + 0.145833u^{75} + \cdots - 5.97917u + 3.02083 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} -0.694407u^{76} - 1.99580u^{75} + \cdots + 9.07051u - 19.4422 \\ 0.222222u^{76} + 0.331597u^{75} + \cdots + 20.5932u - 5.01620 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} 0.672781u^{76} + 1.91826u^{75} + \cdots - 11.6092u + 14.8391 \\ -0.184028u^{76} - 0.301215u^{75} + \cdots - 14.0162u + 3.60880 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -\frac{677}{576}u^{76} - \frac{233}{54}u^{75} + \cdots + \frac{6815}{72}u - \frac{5585}{108}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $u^{77} + 24u^{76} + \cdots + 23104u + 2116$ |
| $c_2, c_6$ | $u^{77} + 4u^{76} + \cdots - 32u + 46$ |
| $c_3, c_{11}$ | $27(27u^{77} - 54u^{76} + \cdots - 329u - 49)$ |
| $c_4$ | $64(64u^{77} - 64u^{76} + \cdots - 7193097u - 7328259)$ |
| $c_5, c_9$ | $27(27u^{77} + 54u^{76} + \cdots + 259u - 49)$ |
| $c_8, c_{12}$ | $u^{77} + 8u^{76} + \cdots + 288144u + 24982$ |
| $c_{10}$ | $64(64u^{77} + 192u^{76} + \cdots + 2.57763 \times 10^7 u - 4.07362 \times 10^7)$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $y^{77} + 60y^{76} + \cdots + 169876672y - 4477456$ |
| $c_2, c_6$ | $y^{77} - 24y^{76} + \cdots + 23104y - 2116$ |
| $c_3, c_{11}$ | $729(729y^{77} - 49572y^{76} + \cdots + 20923y - 2401)$ |
| $c_4$ | $4096$ <br> $\cdot(4096y^{77} + 192512y^{76} + \cdots - 759954294636435y - 53703379971081)$ |
| $c_5, c_9$ | $729(729y^{77} - 26244y^{76} + \cdots + 150283y - 2401)$ |
| $c_8, c_{12}$ | $y^{77} - 44y^{76} + \cdots + 27288625256y - 624100324$ |
| $c_{10}$ | $4096(4096y^{77} - 208896y^{76} + \cdots + 3.66690 \times 10^{16}y - 1.65944 \times 10^{15})$ |

### (vi) Complex Volumes and Cusp Shapes

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.945096+0.389047I$<br>$a=-0.050623-1.070080I$<br>$b=-1.137580-0.286797I$ | $-2.25647-1.16651I$ | 0 |
| $u=-0.945096-0.389047I$<br>$a=-0.050623+1.070080I$<br>$b=-1.137580+0.286797I$ | $-2.25647+1.16651I$ | 0 |
| $u=1.013910+0.200035I$<br>$a=-1.38511+0.76890I$<br>$b=-1.264600-0.574600I$ | $-3.31072-7.02161I$ | $0.+7.58050I$ |
| $u=1.013910-0.200035I$<br>$a=-1.38511-0.76890I$<br>$b=-1.264600+0.574600I$ | $-3.31072+7.02161I$ | $0.-7.58050I$ |
| $u=0.990472+0.339163I$<br>$a=0.261413+0.088872I$<br>$b=-0.074059+0.966853I$ | $4.92520-6.64796I$ | 0 |
| $u=0.990472-0.339163I$<br>$a=0.261413-0.088872I$<br>$b=-0.074059-0.966853I$ | $4.92520+6.64796I$ | 0 |
| $u=1.038030+0.149643I$<br>$a=1.43369-0.68788I$<br>$b=1.211790+0.261921I$ | $-5.95131-2.26654I$ | 0 |
| $u=1.038030-0.149643I$<br>$a=1.43369+0.68788I$<br>$b=1.211790-0.261921I$ | $-5.95131+2.26654I$ | 0 |
| $u=-0.731824+0.784777I$<br>$a=0.776824+0.762762I$<br>$b=-1.101830-0.505985I$ | $0.30848-1.84699I$ | 0 |
| $u=-0.731824-0.784777I$<br>$a=0.776824-0.762762I$<br>$b=-1.101830+0.505985I$ | $0.30848+1.84699I$ | 0 |

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.853104 + 0.340329I$<br>$a = 0.213746 + 0.784050I$<br>$b = -0.255176 - 0.454138I$ | $0.14615 - 3.23036I$ | $-1.33855 + 8.12824I$ |
| $u = 0.853104 - 0.340329I$<br>$a = 0.213746 - 0.784050I$<br>$b = -0.255176 + 0.454138I$ | $0.14615 + 3.23036I$ | $-1.33855 - 8.12824I$ |
| $u = 0.914885$<br>$a = -3.07046$<br>$b = -0.837226$ | $-0.405134$ | $-11.6500$ |
| $u = -0.796108 + 0.747982I$<br>$a = -0.10708 - 1.46416I$<br>$b = 0.752389 + 0.337777I$ | $4.41618 + 1.21466I$ | $0$ |
| $u = -0.796108 - 0.747982I$<br>$a = -0.10708 + 1.46416I$<br>$b = 0.752389 - 0.337777I$ | $4.41618 - 1.21466I$ | $0$ |
| $u = -1.090320 + 0.129993I$<br>$a = -1.262460 + 0.002905I$<br>$b = -0.404038 + 0.480402I$ | $3.57275 - 0.38450I$ | $0$ |
| $u = -1.090320 - 0.129993I$<br>$a = -1.262460 - 0.002905I$<br>$b = -0.404038 - 0.480402I$ | $3.57275 + 0.38450I$ | $0$ |
| $u = -0.745520 + 0.814582I$<br>$a = -1.16110 - 1.01142I$<br>$b = 1.19077 + 0.83255I$ | $3.35457 - 6.24610I$ | $0$ |
| $u = -0.745520 - 0.814582I$<br>$a = -1.16110 + 1.01142I$<br>$b = 1.19077 - 0.83255I$ | $3.35457 + 6.24610I$ | $0$ |
| $u = 0.143068 + 0.884102I$<br>$a = 0.168538 + 0.574471I$<br>$b = -0.837315 - 0.407607I$ | $1.74848 - 1.75393I$ | $4.13656 + 4.20451I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.143068 - 0.884102I$<br>$a = 0.168538 - 0.574471I$<br>$b = -0.837315 + 0.407607I$ | $1.74848 + 1.75393I$ | $4.13656 - 4.20451I$ |
| $u = 0.672918 + 0.883872I$<br>$a = -0.114733 + 0.792856I$<br>$b = 0.786004 - 0.691152I$ | $10.55870 + 0.08501I$ | 0 |
| $u = 0.672918 - 0.883872I$<br>$a = -0.114733 - 0.792856I$<br>$b = 0.786004 + 0.691152I$ | $10.55870 - 0.08501I$ | 0 |
| $u = 0.833547 + 0.780072I$<br>$a = -1.32633 - 0.56782I$<br>$b = 0.720819 + 0.274380I$ | $4.51444 - 3.95451I$ | 0 |
| $u = 0.833547 - 0.780072I$<br>$a = -1.32633 + 0.56782I$<br>$b = 0.720819 - 0.274380I$ | $4.51444 + 3.95451I$ | 0 |
| $u = -1.033180 + 0.514901I$<br>$a = 0.384364 + 1.026620I$<br>$b = 1.154440 + 0.045045I$ | $-3.87527 + 4.08507I$ | 0 |
| $u = -1.033180 - 0.514901I$<br>$a = 0.384364 - 1.026620I$<br>$b = 1.154440 - 0.045045I$ | $-3.87527 - 4.08507I$ | 0 |
| $u = 0.726442 + 0.901497I$<br>$a = -0.783659 + 0.902156I$<br>$b = 1.31104 - 0.70021I$ | $9.3431 + 11.9442I$ | 0 |
| $u = 0.726442 - 0.901497I$<br>$a = -0.783659 - 0.902156I$<br>$b = 1.31104 + 0.70021I$ | $9.3431 - 11.9442I$ | 0 |
| $u = -1.127160 + 0.274111I$<br>$a = -1.36172 - 0.86647I$<br>$b = -1.258500 + 0.560387I$ | $1.39680 + 12.09280I$ | 0 |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-1.127160-0.274111I$<br>$a=-1.36172+0.86647I$<br>$b=-1.258500-0.560387I$ | $1.39680-12.09280I$ | $0$ |
| $u=\ \ 0.711151+0.917982I$<br>$a=\ \ 0.585330-0.692040I$<br>$b=-1.136020+0.575865I$ | $5.31393+5.84981I$ | $0$ |
| $u=\ \ 0.711151-0.917982I$<br>$a=\ \ 0.585330+0.692040I$<br>$b=-1.136020-0.575865I$ | $5.31393-5.84981I$ | $0$ |
| $u=\ \ 0.044264+0.833776I$<br>$a=-0.543789-0.831187I$<br>$b=\ \ 1.135140+0.597942I$ | $5.35934-8.41215I$ | $3.55808+6.04760I$ |
| $u=\ \ 0.044264-0.833776I$<br>$a=-0.543789+0.831187I$<br>$b=\ \ 1.135140-0.597942I$ | $5.35934+8.41215I$ | $3.55808-6.04760I$ |
| $u=-0.786439+0.862035I$<br>$a=\ \ 0.31247+1.67394I$<br>$b=\ \ 0.280886-1.281690I$ | $12.60540-5.08861I$ | $0$ |
| $u=-0.786439-0.862035I$<br>$a=\ \ 0.31247-1.67394I$<br>$b=\ \ 0.280886+1.281690I$ | $12.60540+5.08861I$ | $0$ |
| $u=-0.943461+0.719095I$<br>$a=-0.73688-2.24689I$<br>$b=-0.844466+0.304206I$ | $3.95903+4.37252I$ | $0$ |
| $u=-0.943461-0.719095I$<br>$a=-0.73688+2.24689I$<br>$b=-0.844466-0.304206I$ | $3.95903-4.37252I$ | $0$ |
| $u=-0.811644+0.868166I$<br>$a=-0.333966-1.230620I$<br>$b=-0.301933+0.806219I$ | $7.76103-0.71369I$ | $0$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.811644 - 0.868166I$<br>$a = -0.333966 + 1.230620I$<br>$b = -0.301933 - 0.806219I$ | $7.76103 + 0.71369I$ | 0 |
| $u = 0.915026 + 0.766565I$<br>$a = 1.55554 + 0.50366I$<br>$b = -0.741981 + 0.209231I$ | $4.27170 - 1.87032I$ | 0 |
| $u = 0.915026 - 0.766565I$<br>$a = 1.55554 - 0.50366I$<br>$b = -0.741981 - 0.209231I$ | $4.27170 + 1.87032I$ | 0 |
| $u = 1.148530 + 0.332767I$<br>$a = -0.499979 + 0.643714I$<br>$b = -1.058150 + 0.465766I$ | $1.69031 + 4.35768I$ | 0 |
| $u = 1.148530 - 0.332767I$<br>$a = -0.499979 - 0.643714I$<br>$b = -1.058150 - 0.465766I$ | $1.69031 - 4.35768I$ | 0 |
| $u = -0.796668 + 0.910957I$<br>$a = -0.184326 + 1.034980I$<br>$b = 0.801174 - 0.667508I$ | $10.50630 + 5.08271I$ | 0 |
| $u = -0.796668 - 0.910957I$<br>$a = -0.184326 - 1.034980I$<br>$b = 0.801174 + 0.667508I$ | $10.50630 - 5.08271I$ | 0 |
| $u = -1.194470 + 0.260364I$<br>$a = 1.063800 + 0.584697I$<br>$b = 1.043670 - 0.354227I$ | $-2.80991 + 5.52160I$ | 0 |
| $u = -1.194470 - 0.260364I$<br>$a = 1.063800 - 0.584697I$<br>$b = 1.043670 + 0.354227I$ | $-2.80991 - 5.52160I$ | 0 |
| $u = -0.986381 + 0.731464I$<br>$a = 0.24532 + 2.07161I$<br>$b = 1.195710 - 0.510507I$ | $-0.45855 + 7.58020I$ | 0 |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.986381 - 0.731464I$<br>$a = 0.24532 - 2.07161I$<br>$b = 1.195710 + 0.510507I$ | $-0.45855 - 7.58020I$ | 0 |
| $u = -0.987889 + 0.748346I$<br>$a = -0.27601 - 2.32525I$<br>$b = -1.27502 + 0.83398I$ | $2.61638 + 12.11450I$ | 0 |
| $u = -0.987889 - 0.748346I$<br>$a = -0.27601 + 2.32525I$<br>$b = -1.27502 - 0.83398I$ | $2.61638 - 12.11450I$ | 0 |
| $u = -0.973772 + 0.801220I$<br>$a = -0.577378 - 0.886916I$<br>$b = 0.197456 + 0.855837I$ | $7.24965 + 6.91213I$ | 0 |
| $u = -0.973772 - 0.801220I$<br>$a = -0.577378 + 0.886916I$<br>$b = 0.197456 - 0.855837I$ | $7.24965 - 6.91213I$ | 0 |
| $u = -0.986081 + 0.788378I$<br>$a = 1.18896 + 1.12839I$<br>$b = -0.210187 - 1.323810I$ | $11.9837 + 11.2267I$ | 0 |
| $u = -0.986081 - 0.788378I$<br>$a = 1.18896 - 1.12839I$<br>$b = -0.210187 + 1.323810I$ | $11.9837 - 11.2267I$ | 0 |
| $u = 0.129936 + 0.712668I$<br>$a = 0.383654 - 1.136340I$<br>$b = 0.355434 + 0.865456I$ | $7.69892 + 3.04284I$ | $6.83485 - 1.26769I$ |
| $u = 0.129936 - 0.712668I$<br>$a = 0.383654 + 1.136340I$<br>$b = 0.355434 - 0.865456I$ | $7.69892 - 3.04284I$ | $6.83485 + 1.26769I$ |
| $u = 1.186850 + 0.479807I$<br>$a = 0.484182 - 0.469768I$<br>$b = 0.778824 - 0.199434I$ | $-1.52492 - 3.08303I$ | 0 |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.186850 - 0.479807I$<br>$a = 0.484182 + 0.469768I$<br>$b = 0.778824 + 0.199434I$ | $-1.52492 + 3.08303I$ | 0 |
| $u = 1.034460 + 0.778303I$<br>$a = -0.40734 + 2.19878I$<br>$b = -1.35081 - 0.68759I$ | $8.3818 - 18.1571I$ | 0 |
| $u = 1.034460 - 0.778303I$<br>$a = -0.40734 - 2.19878I$<br>$b = -1.35081 + 0.68759I$ | $8.3818 + 18.1571I$ | 0 |
| $u = 1.057200 + 0.747188I$<br>$a = -0.82609 + 1.39760I$<br>$b = -0.869251 - 0.602242I$ | $9.37216 - 6.14572I$ | 0 |
| $u = 1.057200 - 0.747188I$<br>$a = -0.82609 - 1.39760I$<br>$b = -0.869251 + 0.602242I$ | $9.37216 + 6.14572I$ | 0 |
| $u = -1.000870 + 0.825577I$<br>$a = 0.649141 + 0.084858I$<br>$b = -0.699909 - 0.639831I$ | $9.86775 + 1.31494I$ | 0 |
| $u = -1.000870 - 0.825577I$<br>$a = 0.649141 - 0.084858I$<br>$b = -0.699909 + 0.639831I$ | $9.86775 - 1.31494I$ | 0 |
| $u = 1.048000 + 0.779868I$<br>$a = 0.36845 - 1.81774I$<br>$b = 1.201870 + 0.559633I$ | $4.26339 - 12.11170I$ | 0 |
| $u = 1.048000 - 0.779868I$<br>$a = 0.36845 + 1.81774I$<br>$b = 1.201870 - 0.559633I$ | $4.26339 + 12.11170I$ | 0 |
| $u = -0.301989 + 0.592941I$<br>$a = 0.659545 - 0.510641I$<br>$b = -1.038510 + 0.133211I$ | $-1.93468 + 0.20175I$ | $-5.58615 - 0.28033I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.301989 - 0.592941I$<br>$a = 0.659545 + 0.510641I$<br>$b = -1.038510 - 0.133211I$ | $-1.93468 - 0.20175I$ | $-5.58615 + 0.28033I$ |
| $u = -0.663608$<br>$a = 0.240549$<br>$b = -0.662103$ | $-1.05112$ | $-9.89690$ |
| $u = -0.099805 + 0.595750I$<br>$a = -1.14595 + 0.84142I$<br>$b = 1.054840 - 0.512141I$ | $0.13812 + 4.48157I$ | $0.37821 - 5.73269I$ |
| $u = -0.099805 - 0.595750I$<br>$a = -1.14595 - 0.84142I$<br>$b = 1.054840 + 0.512141I$ | $0.13812 - 4.48157I$ | $0.37821 + 5.73269I$ |
| $u = 0.464539 + 0.371960I$<br>$a = -1.65664 - 0.13643I$<br>$b = 0.231873 - 0.001401I$ | $1.401820 + 0.119914I$ | $6.61037 + 0.17965I$ |
| $u = 0.464539 - 0.371960I$<br>$a = -1.65664 + 0.13643I$<br>$b = 0.231873 + 0.001401I$ | $1.401820 - 0.119914I$ | $6.61037 - 0.17965I$ |
| $u = 0.403195$<br>$a = -3.20121$<br>$b = 0.409741$ | $1.30766$ | $9.19350$ |

**II.** $\boldsymbol{I_2^u = \langle b+1,\ -u^3-8u^2+10a-2u+14,\ u^4-2u^2+2\rangle}$

**(i) Arc colorings**

$$a_2 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_6 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} -u \\ -u^3+u \end{pmatrix}$$
$$a_8 = \begin{pmatrix} -u^2+1 \\ u^2 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} u^3 \\ u^3-u \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} \frac{1}{10}u^3+\frac{4}{5}u^2+\frac{1}{5}u-\frac{7}{5} \\ -1 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} \frac{3}{10}u^3+\frac{2}{5}u^2+\frac{3}{5}u-\frac{1}{5} \\ \frac{2}{5}u^3+\frac{1}{5}u^2-\frac{1}{5}u-\frac{3}{5} \end{pmatrix}$$
$$a_5 = \begin{pmatrix} \frac{1}{10}u^3+\frac{4}{5}u^2+\frac{1}{5}u-\frac{2}{5} \\ -1 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} \frac{3}{10}u^3+\frac{2}{5}u^2-\frac{2}{5}u-\frac{1}{5} \\ -\frac{3}{5}u^3+\frac{1}{5}u^2+\frac{4}{5}u-\frac{3}{5} \end{pmatrix}$$
$$a_9 = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} u \\ u^3-u \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 4u^2-8$

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

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

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $(y^2+4)^2$ |
| $c_2, c_6$ | $(y^2-2y+2)^2$ |
| $c_3, c_5, c_9$ $c_{11}$ | $(y-1)^4$ |
| $c_4, c_{10}$ | $25(25y^4+16y^3+10y^2+1)$ |
| $c_8, c_{12}$ | $(y^2+2y+2)^2$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = \phantom{-}1.098680 + 0.455090I$<br>$a = -0.315904 + 1.046400I$<br>$b = -1.00000$ | $-2.46740 - 3.66386I$ | $-4.00000 + 4.00000I$ |
| $u = \phantom{-}1.098680 - 0.455090I$<br>$a = -0.315904 - 1.046400I$<br>$b = -1.00000$ | $-2.46740 + 3.66386I$ | $-4.00000 - 4.00000I$ |
| $u = -1.098680 + 0.455090I$<br>$a = -0.884096 - 0.553605I$<br>$b = -1.00000$ | $-2.46740 + 3.66386I$ | $-4.00000 - 4.00000I$ |
| $u = -1.098680 - 0.455090I$<br>$a = -0.884096 + 0.553605I$<br>$b = -1.00000$ | $-2.46740 - 3.66386I$ | $-4.00000 + 4.00000I$ |

**III.** $\boldsymbol{I^u_3 =}$
$\boldsymbol{\langle -6a^2u^2 - u^2a + \cdots + 13a + 12,\ a^3 + 2a^2u - 2a^2 + au + u^2 + a - u - 2,\ u^3 - u^2 + 1\rangle}$

**(i) Arc colorings**

$$a_2 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_6 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} -u \\ -u^2 + u + 1 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} -u^2 + 1 \\ u^2 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} u^2 - 1 \\ -u^2 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} a \\ 0.315789a^2u^2 + 0.0526316au^2 + \cdots - 0.684211a - 0.631579 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} 0.210526a^2u^2 + 0.368421au^2 + \cdots + 0.210526a - 0.421053 \\ 0.578947a^2u^2 - 0.736842au^2 + \cdots - 0.421053a - 1.15789 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} -0.789474a^2u^2 + 0.368421au^2 + \cdots + 0.210526a + 1.57895 \\ 0.473684a^2u^2 - 0.421053au^2 + \cdots - 0.526316a - 0.947368 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} -0.315789a^2u^2 + 0.947368au^2 + \cdots - 0.315789a + 0.631579 \\ 0.315789a^2u^2 - 0.947368au^2 + \cdots - 0.684211a - 0.631579 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} u^2 - 1 \\ -u^2 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} u^2 - 1 \\ -u^2 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 4u - 6$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $(u^3 + u^2 + 2u + 1)^3$ |
| $c_2, c_6$ | $(u^3 - u^2 + 1)^3$ |
| $c_3, c_4, c_5$ $c_9, c_{11}$ | $u^9 - 3u^7 - u^6 + 3u^5 + 2u^4 + u^3 - u^2 - 2u - 1$ |
| $c_8, c_{12}$ | $u^9$ |
| $c_{10}$ | $u^9 - 6u^8 + 15u^7 - 17u^6 + 3u^5 + 12u^4 - 9u^3 - u^2 + 2u - 1$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $(y^3 + 3y^2 + 2y - 1)^3$ |
| $c_2, c_6$ | $(y^3 - y^2 + 2y - 1)^3$ |
| $c_3, c_4, c_5$ $c_9, c_{11}$ | $y^9 - 6y^8 + 15y^7 - 17y^6 + 3y^5 + 12y^4 - 9y^3 - y^2 + 2y - 1$ |
| $c_8, c_{12}$ | $y^9$ |
| $c_{10}$ | $y^9 - 6y^8 + 27y^7 - 73y^6 + 139y^5 - 184y^4 + 83y^3 - 13y^2 + 2y - 1$ |

**(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>$a = 0.739154 - 0.526270I$<br>$b = -1.180080 + 0.437737I$ | $3.02413 - 2.82812I$ | $-2.49024 + 2.97945I$ |
| $u = 0.877439 + 0.744862I$<br>$a = -0.523982 + 1.249570I$<br>$b = -0.073457 - 0.802780I$ | $3.02413 - 2.82812I$ | $-2.49024 + 2.97945I$ |
| $u = 0.877439 + 0.744862I$<br>$a = 0.02995 - 2.21303I$<br>$b = 1.253530 + 0.365043I$ | $3.02413 - 2.82812I$ | $-2.49024 + 2.97945I$ |
| $u = 0.877439 - 0.744862I$<br>$a = 0.739154 + 0.526270I$<br>$b = -1.180080 - 0.437737I$ | $3.02413 + 2.82812I$ | $-2.49024 - 2.97945I$ |
| $u = 0.877439 - 0.744862I$<br>$a = -0.523982 - 1.249570I$<br>$b = -0.073457 + 0.802780I$ | $3.02413 + 2.82812I$ | $-2.49024 - 2.97945I$ |
| $u = 0.877439 - 0.744862I$<br>$a = 0.02995 + 2.21303I$<br>$b = 1.253530 - 0.365043I$ | $3.02413 + 2.82812I$ | $-2.49024 - 2.97945I$ |
| $u = -0.754878$<br>$a = 0.007426 + 0.439504I$<br>$b = -0.606217 - 0.320153I$ | $-1.11345$ | $-9.01950$ |
| $u = -0.754878$<br>$a = 0.007426 - 0.439504I$<br>$b = -0.606217 + 0.320153I$ | $-1.11345$ | $-9.01950$ |
| $u = -0.754878$<br>$a = 3.49490$<br>$b = 1.21243$ | $-1.11345$ | $-9.01950$ |

**IV.**

$$\boldsymbol{I^u_4 = \langle -b^2u^2a + b^2au + b^3 + u^2b + u^2a - bu - au - u^2 - b + u - 1,\ u^3 - u^2 + 1\rangle}$$

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= 4u$

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

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

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

| Solution to $I_4^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = \cdots$<br>$a = \cdots$<br>$b = \cdots$ | 0.531480 | $3.50976 + 2.97945I$ |

## V. $I_1^v = \langle a,\ b^3 - b + 1,\ v - 1\rangle$

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= 6$

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

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

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

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

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

| Solutions to $I_1^v$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $v = 1.00000$<br>$a = 0$<br>$b = 0.662359 + 0.562280I$ | 1.64493 | 6.00000 |
| $v = 1.00000$<br>$a = 0$<br>$b = 0.662359 - 0.562280I$ | 1.64493 | 6.00000 |
| $v = 1.00000$<br>$a = 0$<br>$b = -1.32472$ | 1.64493 | 6.00000 |

## VI. $I_2^v = \langle a,\ b-1,\ v-1 \rangle$

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= 0$

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

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

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

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

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

| Solutions to $I_2^v$ | | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|---|
| $v =$ | 1.00000 | | |
| $a =$ | 0 | 0 | 0 |
| $b =$ | 1.00000 | | |

## VII. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^4(u^2-2u+2)^2(u^3+u^2+2u+1)^3$ <br> $\cdot(u^{77}+24u^{76}+\cdots+23104u+2116)$ |
| $c_2, c_6$ | $u^4(u^3-u^2+1)^3(u^4-2u^2+2)(u^{77}+4u^{76}+\cdots-32u+46)$ |
| $c_3$ | $27(u-1)(u+1)^4(u^3-u+1)$ <br> $\cdot(u^9-3u^7-u^6+3u^5+2u^4+u^3-u^2-2u-1)$ <br> $\cdot(27u^{77}-54u^{76}+\cdots-329u-49)$ |
| $c_4$ | $320(u-1)(u^3+2u^2+u+1)(5u^4+8u^3+8u^2+4u+1)$ <br> $\cdot(u^9-3u^7-u^6+3u^5+2u^4+u^3-u^2-2u-1)$ <br> $\cdot(64u^{77}-64u^{76}+\cdots-7193097u-7328259)$ |
| $c_5$ | $27(u-1)(u+1)^4(u^3-u+1)$ <br> $\cdot(u^9-3u^7-u^6+3u^5+2u^4+u^3-u^2-2u-1)$ <br> $\cdot(27u^{77}+54u^{76}+\cdots+259u-49)$ |
| $c_7$ | $u^4(u^2+2u+2)^2(u^3+u^2+2u+1)^3$ <br> $\cdot(u^{77}+24u^{76}+\cdots+23104u+2116)$ |
| $c_8, c_{12}$ | $u^{10}(u-1)^3(u^4+2u^2+2)(u^{77}+8u^{76}+\cdots+288144u+24982)$ |
| $c_9$ | $27(u-1)^4(u+1)(u^3-u+1)$ <br> $\cdot(u^9-3u^7-u^6+3u^5+2u^4+u^3-u^2-2u-1)$ <br> $\cdot(27u^{77}+54u^{76}+\cdots+259u-49)$ |
| $c_{10}$ | $320(u+1)(u^3-u+1)(5u^4+8u^3+8u^2+4u+1)$ <br> $\cdot(u^9-6u^8+15u^7-17u^6+3u^5+12u^4-9u^3-u^2+2u-1)$ <br> $\cdot(64u^{77}+192u^{76}+\cdots+25776279u-40736169)$ |
| $c_{11}$ | $27(u-1)^4(u+1)(u^3-u+1)$ <br> $\cdot(u^9-3u^7-u^6+3u^5+2u^4+u^3-u^2-2u-1)$ <br> $\cdot(27u^{77}-54u^{76}+\cdots-329u-49)$ |

## VIII. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $y^4(y^2+4)^2(y^3+3y^2+2y-1)^3$ <br> $\cdot\,(y^{77}+60y^{76}+\cdots+169876672y-4477456)$ |
| $c_2, c_6$ | $y^4(y^2-2y+2)^2(y^3-y^2+2y-1)^3$ <br> $\cdot\,(y^{77}-24y^{76}+\cdots+23104y-2116)$ |
| $c_3, c_{11}$ | $729(y-1)^5(y^3-2y^2+y-1)$ <br> $\cdot\,(y^9-6y^8+15y^7-17y^6+3y^5+12y^4-9y^3-y^2+2y-1)$ <br> $\cdot\,(729y^{77}-49572y^{76}+\cdots+20923y-2401)$ |
| $c_4$ | $102400(y-1)(y^3-2y^2-3y-1)(25y^4+16y^3+10y^2+1)$ <br> $\cdot\,(y^9-6y^8+15y^7-17y^6+3y^5+12y^4-9y^3-y^2+2y-1)$ <br> $\cdot\,(4096y^{77}+192512y^{76}+\cdots-759954294636435y-53703379971081)$ |
| $c_5, c_9$ | $729(y-1)^5(y^3-2y^2+y-1)$ <br> $\cdot\,(y^9-6y^8+15y^7-17y^6+3y^5+12y^4-9y^3-y^2+2y-1)$ <br> $\cdot\,(729y^{77}-26244y^{76}+\cdots+150283y-2401)$ |
| $c_8, c_{12}$ | $y^{10}(y-1)^3(y^2+2y+2)^2$ <br> $\cdot\,(y^{77}-44y^{76}+\cdots+27288625256y-624100324)$ |
| $c_{10}$ | $102400(y-1)(y^3-2y^2+y-1)(25y^4+16y^3+10y^2+1)$ <br> $\cdot\,(y^9-6y^8+27y^7-73y^6+139y^5-184y^4+83y^3-13y^2+2y-1)$ <br> $\cdot\,(4096y^{77}-2.09\times10^5y^{76}+\cdots+3.67\times10^{16}y-1.66\times10^{15})$ |