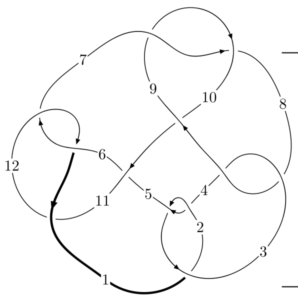
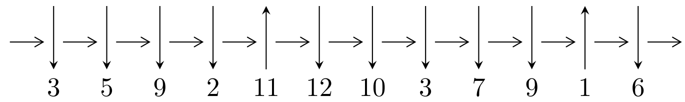
# $12n_{0222}$ ($K12n_{0222}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$\begin{aligned}
I_1^u = \langle & -4.12031 \times 10^{34}u^{30} - 2.31311 \times 10^{35}u^{29} + \cdots + 1.08242 \times 10^{37}d - 4.05250 \times 10^{35}, \\
& -3.25140 \times 10^{35}u^{30} - 1.04293 \times 10^{36}u^{29} + \cdots + 2.16483 \times 10^{37}c - 2.49953 \times 10^{37}, \\
& -6.96435 \times 10^{33}u^{30} + 1.25405 \times 10^{34}u^{29} + \cdots + 1.08242 \times 10^{37}b - 4.63583 \times 10^{36}, \\
& 9.28423 \times 10^{34}u^{30} + 2.43126 \times 10^{35}u^{29} + \cdots + 2.16483 \times 10^{37}a - 1.72516 \times 10^{37},\ u^{31} + 3u^{30} + \cdots + 64u + 3 \\
I_2^u = \langle & 114533971308u^{22}a - 295693377683u^{22} + \cdots + 309089289992a - 1727678279402, \\
& -106328835549u^{22}a - 37415285413u^{22} + \cdots - 881316945982a - 268636021714, \\
& -38636161249u^{22}a + 6684998365u^{22} + \cdots + 212657671098a - 31359529106, \\
& 709294494705u^{22}a - 467986206381u^{22} + \cdots + 1120177291630a + 112735730394, \\
& u^{23} - u^{22} + \cdots + 8u + 4\rangle
\end{aligned}$$

$$\begin{aligned}
I_1^v &= \langle a,\ d,\ c - v,\ b - 1,\ v^2 - v + 1\rangle \\
I_2^v &= \langle c,\ d + v - 1,\ b,\ a - 1,\ v^2 - v + 1\rangle \\
I_3^v &= \langle a,\ d + 1,\ c + a,\ b - 1,\ v + 1\rangle \\
I_4^v &= \langle a,\ a^2d + c^2v - 2ca - cv + a + v,\ dv - 1,\ c^2v^2 - 2cav - v^2c + a^2 + av + v^2,\ b - 1\rangle
\end{aligned}$$

* 5 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 82 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. $I^u_1 = \langle -4.12\times10^{34}u^{30} - 2.31\times10^{35}u^{29} + \cdots + 1.08\times10^{37}d - 4.05\times10^{35},\ -3.25\times10^{35}u^{30} - 1.04\times10^{36}u^{29} + \cdots + 2.16\times10^{37}c - 2.50\times10^{37},\ -6.96\times10^{33}u^{30} + 1.25\times10^{34}u^{29} + \cdots + 1.08\times10^{37}b - 4.64\times10^{36},\ 9.28\times10^{34}u^{30} + 2.43\times10^{35}u^{29} + \cdots + 2.16\times10^{37}a - 1.73\times10^{37},\ u^{31} + 3u^{30} + \cdots + 64u + 32\rangle$**

**(i) Arc colorings**

$$a_3 = \begin{pmatrix}1\\0\end{pmatrix}$$
$$a_9 = \begin{pmatrix}0\\u\end{pmatrix}$$
$$a_4 = \begin{pmatrix}1\\u^2\end{pmatrix}$$
$$a_5 = \begin{pmatrix}-0.00428866u^{30} - 0.0112307u^{29} + \cdots - 0.0728208u + 0.796905\\0.000643408u^{30} - 0.00115856u^{29} + \cdots - 0.160798u + 0.428286\end{pmatrix}$$
$$a_{11} = \begin{pmatrix}0.0150192u^{30} + 0.0481763u^{29} + \cdots + 0.421287u + 1.15461\\0.00380659u^{30} + 0.0213699u^{29} + \cdots + 0.391169u + 0.0374394\end{pmatrix}$$
$$a_6 = \begin{pmatrix}0.0281261u^{30} + 0.0745920u^{29} + \cdots - 0.311221u + 1.89333\\-0.000510466u^{30} - 0.00677158u^{29} + \cdots - 0.959619u + 0.547953\end{pmatrix}$$
$$a_2 = \begin{pmatrix}-0.00428866u^{30} - 0.0112307u^{29} + \cdots - 0.0728208u + 0.796905\\0.00311868u^{30} + 0.0115274u^{29} + \cdots + 0.193379u - 0.480614\end{pmatrix}$$
$$a_1 = \begin{pmatrix}-0.00116998u^{30} + 0.000296647u^{29} + \cdots + 0.120558u + 0.316290\\0.00311868u^{30} + 0.0115274u^{29} + \cdots + 0.193379u - 0.480614\end{pmatrix}$$
$$a_8 = \begin{pmatrix}u\\u\end{pmatrix}$$
$$a_{10} = \begin{pmatrix}0.0150192u^{30} + 0.0481763u^{29} + \cdots + 0.421287u + 1.15461\\0.00163526u^{30} + 0.00866787u^{29} + \cdots + 1.07138u + 0.137237\end{pmatrix}$$
$$a_7 = \begin{pmatrix}-0.0133839u^{30} - 0.0395084u^{29} + \cdots + 0.650092u - 1.01737\\0.00163526u^{30} + 0.00866787u^{29} + \cdots + 1.07138u + 0.137237\end{pmatrix}$$
$$a_{12} = \begin{pmatrix}0.0125773u^{30} + 0.0545128u^{29} + \cdots + 1.19403u + 1.13915\\-0.00454622u^{30} + 0.00263169u^{29} + \cdots - 0.487370u - 0.916371\end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -0.0330834u^{30} - 0.0743041u^{29} + \cdots - 9.35750u - 13.8824$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_{10}$ | $u^{31} + 11u^{30} + \cdots + 21u + 1$ |
| $c_2, c_4, c_7$ <br> $c_9$ | $u^{31} - 5u^{30} + \cdots - 3u + 1$ |
| $c_3, c_8$ | $u^{31} + 3u^{30} + \cdots + 64u + 32$ |
| $c_5$ | $u^{31} + u^{30} + \cdots + 128u + 548$ |
| $c_6, c_{12}$ | $u^{31} - u^{30} + \cdots + 8u + 4$ |
| $c_{11}$ | $u^{31} - 15u^{30} + \cdots + 120u + 16$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_{10}$ | $y^{31} + 29y^{30} + \cdots + 61y - 1$ |
| $c_2, c_4, c_7$ <br> $c_9$ | $y^{31} - 11y^{30} + \cdots + 21y - 1$ |
| $c_3, c_8$ | $y^{31} + 15y^{30} + \cdots + 1024y - 1024$ |
| $c_5$ | $y^{31} - 9y^{30} + \cdots + 4451896y - 300304$ |
| $c_6, c_{12}$ | $y^{31} + 15y^{30} + \cdots + 120y - 16$ |
| $c_{11}$ | $y^{31} + 3y^{30} + \cdots + 25888y - 256$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.753219 + 0.379837I$ | | |
| $a = 0.685053 - 0.287784I$ | | |
| $b = 0.240774 + 0.521238I$ | $1.42006 - 1.96537I$ | $-1.93692 + 5.44006I$ |
| $c = 0.092235 - 0.379751I$ | | |
| $d = 0.881620 - 0.064438I$ | | |
| $u = 0.753219 - 0.379837I$ | | |
| $a = 0.685053 + 0.287784I$ | | |
| $b = 0.240774 - 0.521238I$ | $1.42006 + 1.96537I$ | $-1.93692 - 5.44006I$ |
| $c = 0.092235 + 0.379751I$ | | |
| $d = 0.881620 + 0.064438I$ | | |
| $u = -0.337564 + 1.132290I$ | | |
| $a = 0.17117 - 1.61585I$ | | |
| $b = -0.935169 + 0.612003I$ | $-0.45247 + 2.02679I$ | $-7.73031 - 3.42583I$ |
| $c = 1.049310 + 0.128753I$ | | |
| $d = 0.644525 - 0.213262I$ | | |
| $u = -0.337564 - 1.132290I$ | | |
| $a = 0.17117 + 1.61585I$ | | |
| $b = -0.935169 - 0.612003I$ | $-0.45247 - 2.02679I$ | $-7.73031 + 3.42583I$ |
| $c = 1.049310 - 0.128753I$ | | |
| $d = 0.644525 + 0.213262I$ | | |
| $u = 1.121020 + 0.424146I$ | | |
| $a = 0.460731 + 0.138106I$ | | |
| $b = 0.991521 - 0.596969I$ | $-1.55877 + 4.66712I$ | $-11.51750 - 4.56967I$ |
| $c = -0.139555 + 1.108810I$ | | |
| $d = -0.74679 + 1.41149I$ | | |
| $u = 1.121020 - 0.424146I$ | | |
| $a = 0.460731 - 0.138106I$ | | |
| $b = 0.991521 + 0.596969I$ | $-1.55877 - 4.66712I$ | $-11.51750 + 4.56967I$ |
| $c = -0.139555 - 1.108810I$ | | |
| $d = -0.74679 - 1.41149I$ | | |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.698083 + 0.364692I$ | | |
| $a = 0.498679 + 0.078631I$ | | |
| $b = 0.956651 - 0.308522I$ | $-3.68376 + 3.19069I$ | $-14.6846 - 5.1485I$ |
| $c = -0.575750 + 1.146380I$ | | |
| $d = -0.468258 + 0.349784I$ | | |
| $u = 0.698083 - 0.364692I$ | | |
| $a = 0.498679 - 0.078631I$ | | |
| $b = 0.956651 + 0.308522I$ | $-3.68376 - 3.19069I$ | $-14.6846 + 5.1485I$ |
| $c = -0.575750 - 1.146380I$ | | |
| $d = -0.468258 - 0.349784I$ | | |
| $u = -1.235540 + 0.189024I$ | | |
| $a = 0.472913 - 0.179552I$ | | |
| $b = 0.848142 + 0.701686I$ | $2.56816 - 1.34649I$ | $-5.38369 + 2.07194I$ |
| $c = 0.035497 + 0.968785I$ | | |
| $d = -0.04493 + 1.73894I$ | | |
| $u = -1.235540 - 0.189024I$ | | |
| $a = 0.472913 + 0.179552I$ | | |
| $b = 0.848142 - 0.701686I$ | $2.56816 + 1.34649I$ | $-5.38369 - 2.07194I$ |
| $c = 0.035497 - 0.968785I$ | | |
| $d = -0.04493 - 1.73894I$ | | |
| $u = 0.464557 + 1.163760I$ | | |
| $a = -0.05406 + 1.60814I$ | | |
| $b = -1.020880 - 0.621136I$ | $-1.15318 - 7.72517I$ | $-9.61403 + 8.29170I$ |
| $c = -1.134180 + 0.111276I$ | | |
| $d = -0.725633 - 0.668879I$ | | |
| $u = 0.464557 - 1.163760I$ | | |
| $a = -0.05406 - 1.60814I$ | | |
| $b = -1.020880 + 0.621136I$ | $-1.15318 + 7.72517I$ | $-9.61403 - 8.29170I$ |
| $c = -1.134180 - 0.111276I$ | | |
| $d = -0.725633 + 0.668879I$ | | |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.253240 + 0.506936I$<br>$a = 0.439439 - 0.143874I$<br>$b = 1.055310 + 0.672917I$<br>$c = 0.059221 + 1.157240I$<br>$d = 1.07042 + 1.84800I$ | $1.12377 - 9.51847I$ | $-8.01541 + 7.69926I$ |
| $u = -1.253240 - 0.506936I$<br>$a = 0.439439 + 0.143874I$<br>$b = 1.055310 - 0.672917I$<br>$c = 0.059221 - 1.157240I$<br>$d = 1.07042 - 1.84800I$ | $1.12377 + 9.51847I$ | $-8.01541 - 7.69926I$ |
| $u = 0.223678 + 1.371700I$<br>$a = 0.413752 - 0.939419I$<br>$b = -0.607334 + 0.891545I$<br>$c = 0.818360 - 0.177114I$<br>$d = -0.009021 + 1.183990I$ | $4.93468 + 0.57606I$ | $-5.79676 - 1.97891I$ |
| $u = 0.223678 - 1.371700I$<br>$a = 0.413752 + 0.939419I$<br>$b = -0.607334 - 0.891545I$<br>$c = 0.818360 + 0.177114I$<br>$d = -0.009021 - 1.183990I$ | $4.93468 - 0.57606I$ | $-5.79676 + 1.97891I$ |
| $u = -0.591801$<br>$a = 0.699591$<br>$b = 0.429406$<br>$c = 0.311574$<br>$d = -0.304897$ | $-0.834149$ | $-11.9720$ |
| $u = -0.540907 + 0.236782I$<br>$a = 0.518602 - 0.047373I$<br>$b = 0.912302 + 0.174686I$<br>$c = 1.02746 + 1.03902I$<br>$d = 0.239860 + 0.130978I$ | $-3.12062 + 1.49349I$ | $-14.4230 - 1.8126I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.540907 - 0.236782I$<br>$a = 0.518602 + 0.047373I$<br>$b = 0.912302 - 0.174686I$<br>$c = 1.02746 - 1.03902I$<br>$d = 0.239860 - 0.130978I$ | $-3.12062 - 1.49349I$ | $-14.4230 + 1.8126I$ |
| $u = 0.067118 + 0.557682I$<br>$a = 1.45537 - 0.23813I$<br>$b = -0.330807 + 0.109496I$<br>$c = 0.107319 + 0.187646I$<br>$d = 0.183545 + 0.746172I$ | $-0.46111 + 2.29513I$ | $-1.47827 - 3.85950I$ |
| $u = 0.067118 - 0.557682I$<br>$a = 1.45537 + 0.23813I$<br>$b = -0.330807 - 0.109496I$<br>$c = 0.107319 - 0.187646I$<br>$d = 0.183545 - 0.746172I$ | $-0.46111 - 2.29513I$ | $-1.47827 + 3.85950I$ |
| $u = 0.71578 + 1.28059I$<br>$a = -0.37486 + 1.39000I$<br>$b = -1.180860 - 0.670647I$<br>$c = -1.256580 + 0.035321I$<br>$d = -0.69622 - 1.82856I$ | $1.16605 - 11.32090I$ | $-10.43454 + 6.71502I$ |
| $u = 0.71578 - 1.28059I$<br>$a = -0.37486 - 1.39000I$<br>$b = -1.180860 + 0.670647I$<br>$c = -1.256580 - 0.035321I$<br>$d = -0.69622 + 1.82856I$ | $1.16605 + 11.32090I$ | $-10.43454 - 6.71502I$ |
| $u = -0.39077 + 1.46203I$<br>$a = 0.382686 + 0.821951I$<br>$b = -0.534475 - 0.999877I$<br>$c = -0.804151 - 0.273493I$<br>$d = -0.06766 + 1.69998I$ | $8.24554 + 4.31764I$ | $-2.71892 - 1.88458I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.39077-1.46203I$<br>$a=\ \ 0.382686-0.821951I$<br>$b=-0.534475+0.999877I$<br>$c=-0.804151+0.273493I$<br>$d=-0.06766-1.69998I$ | $8.24554-4.31764I$ | $-2.71892+1.88458I$ |
| $u=-0.79393+1.30401I$<br>$a=-0.444220-1.327190I$<br>$b=-1.226790+0.677567I$<br>$c=\ \ 1.286380+0.018874I$<br>$d=\ \ 0.74586-2.20933I$ | $3.7041+16.8176I$ | $-8.02968-10.05725I$ |
| $u=-0.79393-1.30401I$<br>$a=-0.444220+1.327190I$<br>$b=-1.226790-0.677567I$<br>$c=\ \ 1.286380-0.018874I$<br>$d=\ \ 0.74586+2.20933I$ | $3.7041-16.8176I$ | $-8.02968+10.05725I$ |
| $u=-0.62073+1.40356I$<br>$a=-0.237422-1.289560I$<br>$b=-1.138090+0.750034I$<br>$c=\ \ 1.210460-0.013304I$<br>$d=\ \ 0.01599-1.62087I$ | $6.51517+8.00123I$ | $-4.81025-4.92455I$ |
| $u=-0.62073-1.40356I$<br>$a=-0.237422+1.289560I$<br>$b=-1.138090-0.750034I$<br>$c=\ \ 1.210460+0.013304I$<br>$d=\ \ 0.01599+1.62087I$ | $6.51517-8.00123I$ | $-4.81025+4.92455I$ |
| $u=-0.07489+1.53753I$<br>$a=\ \ 0.262372+0.979829I$<br>$b=-0.744999-0.952303I$<br>$c=-0.931800-0.183463I$<br>$d=\ \ 0.629132+0.977280I$ | $9.13328-4.81435I$ | $-2.44035+4.85668I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.07489 - 1.53753I$ | | |
| $a = \quad 0.262372 - 0.979829I$ | | |
| $b = -0.744999 + 0.952303I$ | $9.13328 + 4.81435I$ | $-2.44035 - 4.85668I$ |
| $c = -0.931800 + 0.183463I$ | | |
| $d = \quad 0.629132 - 0.977280I$ | | |

**II.**

$$I^u_2 = \langle 1.15\times10^{11}au^{22}-2.96\times10^{11}u^{22}+\cdots+3.09\times10^{11}a-1.73\times10^{12},\ -1.06\times10^{11}au^{22}-3.74\times10^{10}u^{22}+\cdots-8.81\times10^{11}a-2.69\times10^{11},\ -3.86\times10^{10}au^{22}+6.68\times10^{9}u^{22}+\cdots+2.13\times10^{11}a-3.14\times10^{10},\ 7.09\times10^{11}au^{22}-4.68\times10^{11}u^{22}+\cdots+1.12\times10^{12}a+1.13\times10^{11},\ u^{23}-u^{22}+\cdots+8u+4\rangle$$

**(i) Arc colorings**

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

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

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

$$a_5 = \begin{pmatrix}a\\0.134392au^{22}-0.0232531u^{22}+\cdots-0.739709a+0.109081\end{pmatrix}$$

$$a_{11} = \begin{pmatrix}0.184927au^{22}+0.0650727u^{22}+\cdots+1.53279a+0.467212\\-0.199198au^{22}+0.514270u^{22}+\cdots-0.537569a+3.00478\end{pmatrix}$$

$$a_6 = \begin{pmatrix}0.0536818au^{22}-0.109233u^{22}+\cdots+1.15888a-1.35137\\0.147105au^{22}-0.215441u^{22}+\cdots-2.41722a-0.588197\end{pmatrix}$$

$$a_2 = \begin{pmatrix}a\\-0.134392au^{22}+0.0232531u^{22}+\cdots+0.739709a-0.109081\end{pmatrix}$$

$$a_1 = \begin{pmatrix}-0.134392au^{22}+0.0232531u^{22}+\cdots+1.73971a-0.109081\\-0.134392au^{22}+0.0232531u^{22}+\cdots+0.739709a-0.109081\end{pmatrix}$$

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

$$a_{10} = \begin{pmatrix}0.184927au^{22}+0.0650727u^{22}+\cdots+1.53279a+0.467212\\0.315073u^{22}-0.449465u^{21}+\cdots+3.96032u+2.46721\end{pmatrix}$$

$$a_7 = \begin{pmatrix}-0.184927au^{22}+0.250000u^{22}+\cdots-1.53279a+2\\0.315073u^{22}-0.449465u^{21}+\cdots+3.96032u+2.46721\end{pmatrix}$$

$$a_{12} = \begin{pmatrix}-0.0514525au^{22}+0.220414u^{22}+\cdots+1.82586a+0.884563\\-0.655758au^{22}+0.669612u^{22}+\cdots-0.373694a+3.42213\end{pmatrix}$$

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

**(iii) Cusp Shapes**
$= -\frac{173371509589}{143744120962}u^{22}+\frac{241902270957}{143744120962}u^{21}+\cdots+\frac{379864412243}{143744120962}u-\frac{545150434432}{71872060481}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_{10}$ | $u^{46} + 23u^{45} + \cdots + 288u + 256$ |
| $c_2, c_4, c_7$ $c_9$ | $u^{46} - 3u^{45} + \cdots - 56u + 16$ |
| $c_3, c_8$ | $(u^{23} - u^{22} + \cdots + 8u + 4)^2$ |
| $c_5$ | $(u^{23} + 2u^{22} + \cdots + 18u + 9)^2$ |
| $c_6, c_{12}$ | $(u^{23} - 2u^{22} + \cdots - 2u + 1)^2$ |
| $c_{11}$ | $(u^{23} - 12u^{22} + \cdots - 2u + 1)^2$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_{10}$ | $y^{46} - 3y^{45} + \cdots - 2449920y + 65536$ |
| $c_2, c_4, c_7$ $c_9$ | $y^{46} - 23y^{45} + \cdots - 288y + 256$ |
| $c_3, c_8$ | $(y^{23} + 15y^{22} + \cdots - 40y - 16)^2$ |
| $c_5$ | $(y^{23} - 12y^{22} + \cdots - 450y - 81)^2$ |
| $c_6, c_{12}$ | $(y^{23} + 12y^{22} + \cdots - 2y - 1)^2$ |
| $c_{11}$ | $(y^{23} + 24y^{21} + \cdots + 10y - 1)^2$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.969482$<br>$a = 0.546696 + 0.177229I$<br>$b = 0.655217 - 0.536590I$<br>$c = 0.145831 + 0.725301I$<br>$d = -0.392946 + 0.853527I$ | $-0.502753$ | $-9.67610$ |
| $u = -0.969482$<br>$a = 0.546696 - 0.177229I$<br>$b = 0.655217 + 0.536590I$<br>$c = 0.145831 - 0.725301I$<br>$d = -0.392946 - 0.853527I$ | $-0.502753$ | $-9.67610$ |
| $u = 0.308169 + 0.985429I$<br>$a = 0.430219 + 0.027076I$<br>$b = 1.315230 - 0.145711I$<br>$c = -1.015110 + 0.244961I$<br>$d = -1.008850 + 0.100976I$ | $-2.62555 - 2.00215I$ | $-10.76412 + 3.62705I$ |
| $u = 0.308169 + 0.985429I$<br>$a = 0.35592 + 1.88659I$<br>$b = -0.903437 - 0.511840I$<br>$c = -0.13961 + 1.69019I$<br>$d = -0.798336 - 1.133280I$ | $-2.62555 - 2.00215I$ | $-10.76412 + 3.62705I$ |
| $u = 0.308169 - 0.985429I$<br>$a = 0.430219 - 0.027076I$<br>$b = 1.315230 + 0.145711I$<br>$c = -1.015110 - 0.244961I$<br>$d = -1.008850 - 0.100976I$ | $-2.62555 + 2.00215I$ | $-10.76412 - 3.62705I$ |
| $u = 0.308169 - 0.985429I$<br>$a = 0.35592 - 1.88659I$<br>$b = -0.903437 + 0.511840I$<br>$c = -0.13961 - 1.69019I$<br>$d = -0.798336 + 1.133280I$ | $-2.62555 + 2.00215I$ | $-10.76412 - 3.62705I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.107498+1.054050I$<br>$a=\ \ 0.716893+1.112390I$<br>$b=-0.590662-0.635162I$<br>$c=\ \ 0.855712+0.135596I$<br>$d=\ \ 0.567042+0.449517I$ | $0.12065+2.74438I$ | $-5.99863-3.42075I$ |
| $u=-0.107498+1.054050I$<br>$a=\ \ 0.60269-1.46286I$<br>$b=-0.759232+0.584397I$<br>$c=-0.709753+0.020633I$<br>$d=-0.464556+0.774218I$ | $0.12065+2.74438I$ | $-5.99863-3.42075I$ |
| $u=-0.107498-1.054050I$<br>$a=\ \ 0.716893-1.112390I$<br>$b=-0.590662+0.635162I$<br>$c=\ \ 0.855712-0.135596I$<br>$d=\ \ 0.567042-0.449517I$ | $0.12065-2.74438I$ | $-5.99863+3.42075I$ |
| $u=-0.107498-1.054050I$<br>$a=\ \ 0.60269+1.46286I$<br>$b=-0.759232-0.584397I$<br>$c=-0.709753-0.020633I$<br>$d=-0.464556-0.774218I$ | $0.12065-2.74438I$ | $-5.99863+3.42075I$ |
| $u=-0.000983+1.149400I$<br>$a=\ \ 0.547631-1.231120I$<br>$b=-0.698366+0.678096I$<br>$c=\ \ 0.00032+1.69379I$<br>$d=\ \ 0.00309-1.75784I$ | $0.86138-1.33135I$ | $-4.84050+0.67575I$ |
| $u=-0.000983+1.149400I$<br>$a=\ \ 0.417486-0.000081I$<br>$b=\ \ 1.395290+0.000467I$<br>$c=\ \ 0.824032+0.023570I$<br>$d=\ \ 0.325917+0.597656I$ | $0.86138-1.33135I$ | $-4.84050+0.67575I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.000983 - 1.149400I$<br>$a = 0.547631 + 1.231120I$<br>$b = -0.698366 - 0.678096I$<br>$c = 0.00032 - 1.69379I$<br>$d = 0.00309 + 1.75784I$ | $0.86138 + 1.33135I$ | $-4.84050 - 0.67575I$ |
| $u = -0.000983 - 1.149400I$<br>$a = 0.417486 + 0.000081I$<br>$b = 1.395290 - 0.000467I$<br>$c = 0.824032 - 0.023570I$<br>$d = 0.325917 - 0.597656I$ | $0.86138 + 1.33135I$ | $-4.84050 - 0.67575I$ |
| $u = 1.222080 + 0.199525I$<br>$a = 0.508002 - 0.253270I$<br>$b = 0.576609 + 0.786036I$<br>$c = -0.046249 + 0.972025I$<br>$d = 0.00251 + 1.70085I$ | $2.55344 + 3.99588I$ | $-5.39099 - 3.49800I$ |
| $u = 1.222080 + 0.199525I$<br>$a = 0.473795 + 0.176635I$<br>$b = 0.853067 - 0.690841I$<br>$c = 0.109495 - 0.759619I$<br>$d = 1.20097 - 1.25900I$ | $2.55344 + 3.99588I$ | $-5.39099 - 3.49800I$ |
| $u = 1.222080 - 0.199525I$<br>$a = 0.508002 + 0.253270I$<br>$b = 0.576609 - 0.786036I$<br>$c = -0.046249 - 0.972025I$<br>$d = 0.00251 - 1.70085I$ | $2.55344 - 3.99588I$ | $-5.39099 + 3.49800I$ |
| $u = 1.222080 - 0.199525I$<br>$a = 0.473795 - 0.176635I$<br>$b = 0.853067 + 0.690841I$<br>$c = 0.109495 + 0.759619I$<br>$d = 1.20097 + 1.25900I$ | $2.55344 - 3.99588I$ | $-5.39099 + 3.49800I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.383777+1.192290I$<br>$a=\ \ 0.06728-1.54278I$<br>$b=-0.971785+0.646950I$<br>$c=\ \ 0.08568+1.62327I$<br>$d=\ \ 1.25576-1.64401I$ | $0.03073+6.47771I$ | $-7.22220-6.52194I$ |
| $u=-0.383777+1.192290I$<br>$a=\ \ 0.411691-0.031373I$<br>$b=\ \ 1.41498+0.18404I$<br>$c=\ \ 1.084230+0.092026I$<br>$d=\ \ 0.516239-0.437185I$ | $0.03073+6.47771I$ | $-7.22220-6.52194I$ |
| $u=-0.383777-1.192290I$<br>$a=\ \ 0.06728+1.54278I$<br>$b=-0.971785-0.646950I$<br>$c=\ \ 0.08568-1.62327I$<br>$d=\ \ 1.25576+1.64401I$ | $0.03073-6.47771I$ | $-7.22220+6.52194I$ |
| $u=-0.383777-1.192290I$<br>$a=\ \ 0.411691+0.031373I$<br>$b=\ \ 1.41498-0.18404I$<br>$c=\ \ 1.084230-0.092026I$<br>$d=\ \ 0.516239+0.437185I$ | $0.03073-6.47771I$ | $-7.22220+6.52194I$ |
| $u=\ \ 0.494865+0.507562I$<br>$a=\ \ 0.478200+0.048575I$<br>$b=\ \ 1.069820-0.210247I$<br>$c=-1.52565+0.64156I$<br>$d=-3.09128+0.72732I$ | $-4.00909-1.37448I$ | $-14.7018+4.3512I$ |
| $u=\ \ 0.494865+0.507562I$<br>$a=-1.22900+4.29549I$<br>$b=-1.061570-0.215187I$<br>$c=-0.62919+1.55437I$<br>$d=-0.560840-0.069102I$ | $-4.00909-1.37448I$ | $-14.7018+4.3512I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.494865 - 0.507562I$<br>$a = 0.478200 - 0.048575I$<br>$b = 1.069820 + 0.210247I$<br>$c = -1.52565 - 0.64156I$<br>$d = -3.09128 - 0.72732I$ | $-4.00909 + 1.37448I$ | $-14.7018 - 4.3512I$ |
| $u = 0.494865 - 0.507562I$<br>$a = -1.22900 - 4.29549I$<br>$b = -1.061570 + 0.215187I$<br>$c = -0.62919 - 1.55437I$<br>$d = -0.560840 + 0.069102I$ | $-4.00909 + 1.37448I$ | $-14.7018 - 4.3512I$ |
| $u = -0.441227 + 0.551458I$<br>$a = 0.894756 + 0.404298I$<br>$b = -0.071873 - 0.419376I$<br>$c = 0.57801 + 1.66032I$<br>$d = 0.559533 - 0.183511I$ | $-1.18777 - 0.88878I$ | $-5.60709 - 0.92577I$ |
| $u = -0.441227 + 0.551458I$<br>$a = 0.472778 - 0.042452I$<br>$b = 1.098240 + 0.188408I$<br>$c = -0.217661 - 0.135410I$<br>$d = -0.659821 + 0.435772I$ | $-1.18777 - 0.88878I$ | $-5.60709 - 0.92577I$ |
| $u = -0.441227 - 0.551458I$<br>$a = 0.894756 - 0.404298I$<br>$b = -0.071873 + 0.419376I$<br>$c = 0.57801 - 1.66032I$<br>$d = 0.559533 + 0.183511I$ | $-1.18777 + 0.88878I$ | $-5.60709 + 0.92577I$ |
| $u = -0.441227 - 0.551458I$<br>$a = 0.472778 + 0.042452I$<br>$b = 1.098240 - 0.188408I$<br>$c = -0.217661 + 0.135410I$<br>$d = -0.659821 - 0.435772I$ | $-1.18777 + 0.88878I$ | $-5.60709 + 0.92577I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.598699+0.195967I$<br>$a=0.530888-0.055930I$<br>$b=0.862960+0.196265I$<br>$c=2.04319+0.35996I$<br>$d=4.54195+0.43654I$ | $-3.01275-2.59653I$ | $-13.46303+3.78636I$ |
| $u=-0.598699+0.195967I$<br>$a=-5.34285-3.08636I$<br>$b=-1.140340+0.081067I$<br>$c=0.898106+0.859760I$<br>$d=0.182289+0.201936I$ | $-3.01275-2.59653I$ | $-13.46303+3.78636I$ |
| $u=-0.598699-0.195967I$<br>$a=0.530888+0.055930I$<br>$b=0.862960-0.196265I$<br>$c=2.04319-0.35996I$<br>$d=4.54195-0.43654I$ | $-3.01275+2.59653I$ | $-13.46303-3.78636I$ |
| $u=-0.598699-0.195967I$<br>$a=-5.34285+3.08636I$<br>$b=-1.140340-0.081067I$<br>$c=0.898106-0.859760I$<br>$d=0.182289-0.201936I$ | $-3.01275+2.59653I$ | $-13.46303-3.78636I$ |
| $u=-0.51611+1.32552I$<br>$a=0.461233+0.756174I$<br>$b=-0.412094-0.963850I$<br>$c=1.162240+0.022087I$<br>$d=0.201349-1.083730I$ | $3.51902+5.35900I$ | $-7.50458-3.06793I$ |
| $u=-0.51611+1.32552I$<br>$a=-0.132196-1.384640I$<br>$b=-1.068330+0.715684I$<br>$c=-0.714060-0.294716I$<br>$d=-0.57921+1.63741I$ | $3.51902+5.35900I$ | $-7.50458-3.06793I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.51611 - 1.32552I$<br>$a = \ \ 0.461233 - 0.756174I$<br>$b = -0.412094 + 0.963850I$<br>$c = \ \ 1.162240 - 0.022087I$<br>$d = \ \ 0.201349 + 1.083730I$ | $3.51902 - 5.35900I$ | $-7.50458 + 3.06793I$ |
| $u = -0.51611 - 1.32552I$<br>$a = -0.132196 + 1.384640I$<br>$b = -1.068330 - 0.715684I$<br>$c = -0.714060 + 0.294716I$<br>$d = -0.57921 - 1.63741I$ | $3.51902 - 5.35900I$ | $-7.50458 + 3.06793I$ |
| $u = \ \ 0.63403 + 1.38420I$<br>$a = \ \ 0.425486 - 0.700704I$<br>$b = -0.366859 + 1.042680I$<br>$c = -1.216340 - 0.005176I$<br>$d = -0.11894 - 1.65112I$ | $6.36348 - 10.62070I$ | $-4.97373 + 6.45650I$ |
| $u = \ \ 0.63403 + 1.38420I$<br>$a = -0.254465 + 1.306340I$<br>$b = -1.143660 - 0.737515I$<br>$c = \ \ 0.717396 - 0.359583I$<br>$d = \ \ 0.78471 + 1.94831I$ | $6.36348 - 10.62070I$ | $-4.97373 + 6.45650I$ |
| $u = \ \ 0.63403 - 1.38420I$<br>$a = \ \ 0.425486 + 0.700704I$<br>$b = -0.366859 - 1.042680I$<br>$c = -1.216340 + 0.005176I$<br>$d = -0.11894 + 1.65112I$ | $6.36348 + 10.62070I$ | $-4.97373 - 6.45650I$ |
| $u = \ \ 0.63403 - 1.38420I$<br>$a = -0.254465 - 1.306340I$<br>$b = -1.143660 + 0.737515I$<br>$c = \ \ 0.717396 + 0.359583I$<br>$d = \ \ 0.78471 - 1.94831I$ | $6.36348 + 10.62070I$ | $-4.97373 - 6.45650I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.37388+1.47842I$<br>$a = 0.371907-0.829286I$<br>$b = -0.549766+1.003940I$<br>$c = -1.105830-0.059862I$<br>$d = 0.536481-0.654741I$ | $8.32991-1.64388I$ | $-2.69530+0.40272I$ |
| $u = 0.37388+1.47842I$<br>$a = -0.005040+1.210940I$<br>$b = -1.003440-0.825793I$<br>$c = 0.815223-0.271139I$<br>$d = -0.00306+1.69575I$ | $8.32991-1.64388I$ | $-2.69530+0.40272I$ |
| $u = 0.37388-1.47842I$<br>$a = 0.371907+0.829286I$<br>$b = -0.549766-1.003940I$<br>$c = -1.105830+0.059862I$<br>$d = 0.536481+0.654741I$ | $8.32991+1.64388I$ | $-2.69530-0.40272I$ |
| $u = 0.37388-1.47842I$<br>$a = -0.005040-1.210940I$<br>$b = -1.003440+0.825793I$<br>$c = 0.815223+0.271139I$<br>$d = -0.00306-1.69575I$ | $8.32991+1.64388I$ | $-2.69530-0.40272I$ |

### III. $I_1^v = \langle a,\ d,\ c - v,\ b - 1,\ v^2 - v + 1 \rangle$

**(i) Arc colorings**

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

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

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

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

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

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

$$a_2 = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$

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

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

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

$$a_{12} = \begin{pmatrix} v \\ -v \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -4v - 7$

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

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

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

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

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

| | Solutions to $I_1^v$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|---|
| $v =$ | $0.500000 + 0.866025I$ | | |
| $a =$ | $0$ | | |
| $b =$ | $1.00000$ | $-1.64493 + 2.02988I$ | $-9.00000 - 3.46410I$ |
| $c =$ | $0.500000 + 0.866025I$ | | |
| $d =$ | $0$ | | |
| $v =$ | $0.500000 - 0.866025I$ | | |
| $a =$ | $0$ | | |
| $b =$ | $1.00000$ | $-1.64493 - 2.02988I$ | $-9.00000 + 3.46410I$ |
| $c =$ | $0.500000 - 0.866025I$ | | |
| $d =$ | $0$ | | |

## IV. $I_2^v = \langle c,\ d+v-1,\ b,\ a-1,\ v^2-v+1 \rangle$

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= 4v - 11$

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

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

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

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

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

| | Solutions to $I_2^v$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|---|
| $v =$ | $0.500000 + 0.866025I$ | | |
| $a =$ | $1.00000$ | | |
| $b =$ | $0$ | $-1.64493 - 2.02988I$ | $-9.00000 + 3.46410I$ |
| $c =$ | $0$ | | |
| $d =$ | $0.500000 - 0.866025I$ | | |
| $v =$ | $0.500000 - 0.866025I$ | | |
| $a =$ | $1.00000$ | | |
| $b =$ | $0$ | $-1.64493 + 2.02988I$ | $-9.00000 - 3.46410I$ |
| $c =$ | $0$ | | |
| $d =$ | $0.500000 + 0.866025I$ | | |

## V. $I_3^v = \langle a,\ d+1,\ c+a,\ b-1,\ v+1\rangle$

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= -12$

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

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

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

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

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

| Solutions to $I_3^v$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $v = -1.00000$<br>$a = 0$<br>$b = 1.00000$<br>$c = 0$<br>$d = -1.00000$ | $-3.28987$ | $-12.0000$ |

**VI.**

$\boldsymbol{I_4^v = \langle a,\ c^2v - cv + \cdots - 2ca + a,\ dv - 1,\ c^2v^2 - v^2c + \cdots + a^2 + av,\ b - 1\rangle}$

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= d^2 + v^2 - 4c - 12$

**(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 $I_4^v$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $v = \cdots$<br>$a = \cdots$<br>$b = \cdots$<br>$c = \cdots$<br>$d = \cdots$ | $-3.28987 - 2.02988I$ | $-12.31314 - 3.47908I$ |

## VII. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^2(u-1)^3(u^{31}+11u^{30}+\cdots+21u+1)$ $\cdot(u^{46}+23u^{45}+\cdots+288u+256)$ |
| $c_2, c_7$ | $u^2(u-1)^3(u^{31}-5u^{30}+\cdots-3u+1)(u^{46}-3u^{45}+\cdots-56u+16)$ |
| $c_3, c_8$ | $u^5(u^{23}-u^{22}+\cdots+8u+4)^2(u^{31}+3u^{30}+\cdots+64u+32)$ |
| $c_4, c_9$ | $u^2(u+1)^3(u^{31}-5u^{30}+\cdots-3u+1)(u^{46}-3u^{45}+\cdots-56u+16)$ |
| $c_5$ | $u(u^2-u+1)(u^2+u+1)(u^{23}+2u^{22}+\cdots+18u+9)^2$ $\cdot(u^{31}+u^{30}+\cdots+128u+548)$ |
| $c_6, c_{12}$ | $u(u^2-u+1)(u^2+u+1)(u^{23}-2u^{22}+\cdots-2u+1)^2$ $\cdot(u^{31}-u^{30}+\cdots+8u+4)$ |
| $c_{10}$ | $u^2(u+1)^3(u^{31}+11u^{30}+\cdots+21u+1)$ $\cdot(u^{46}+23u^{45}+\cdots+288u+256)$ |
| $c_{11}$ | $u(u^2+u+1)^2(u^{23}-12u^{22}+\cdots-2u+1)^2$ $\cdot(u^{31}-15u^{30}+\cdots+120u+16)$ |

## VIII. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_{10}$ | $y^2(y-1)^3(y^{31}+29y^{30}+\cdots+61y-1)$ $\cdot(y^{46}-3y^{45}+\cdots-2449920y+65536)$ |
| $c_2, c_4, c_7$ $c_9$ | $y^2(y-1)^3(y^{31}-11y^{30}+\cdots+21y-1)$ $\cdot(y^{46}-23y^{45}+\cdots-288y+256)$ |
| $c_3, c_8$ | $y^5(y^{23}+15y^{22}+\cdots-40y-16)^2$ $\cdot(y^{31}+15y^{30}+\cdots+1024y-1024)$ |
| $c_5$ | $y(y^2+y+1)^2(y^{23}-12y^{22}+\cdots-450y-81)^2$ $\cdot(y^{31}-9y^{30}+\cdots+4451896y-300304)$ |
| $c_6, c_{12}$ | $y(y^2+y+1)^2(y^{23}+12y^{22}+\cdots-2y-1)^2$ $\cdot(y^{31}+15y^{30}+\cdots+120y-16)$ |
| $c_{11}$ | $y(y^2+y+1)^2(y^{23}+24y^{21}+\cdots+10y-1)^2$ $\cdot(y^{31}+3y^{30}+\cdots+25888y-256)$ |