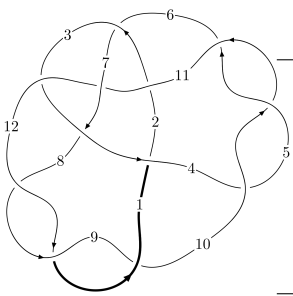
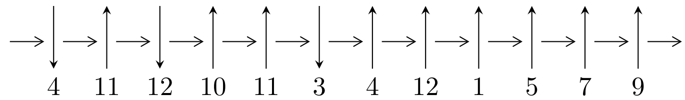
# $12n_{0707}$ ($K12n_{0707}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$I_1^u = \langle -114u^{14} - 108u^{13} + \cdots + 299b - 79,\ 310u^{14} + 215u^{13} + \cdots + 299a - 593,$$
$$u^{15} - 8u^{13} + 25u^{11} - 33u^9 + 2u^7 - u^6 + 37u^5 + 2u^4 - 27u^3 - u^2 + u + 1\rangle$$
$$I_2^u = \langle 1.65560 \times 10^{32}u^{39} + 3.59685 \times 10^{32}u^{38} + \cdots + 2.03419 \times 10^{33}b + 3.23849 \times 10^{33},$$
$$-2.30658 \times 10^{33}u^{39} - 2.80492 \times 10^{33}u^{38} + \cdots + 1.42393 \times 10^{34}a - 3.27516 \times 10^{34},\ u^{40} - u^{39} + \cdots + 2u -$$
$$I_3^u = \langle u^3 + b - 2u,\ u^4 - u^3 - 2u^2 + a + u,\ u^5 - 3u^3 + 2u - 1\rangle$$
$$I_4^u = \langle u^7 - 4u^5 - u^4 + 3u^3 + 3u^2 + b + u - 1,\ -3u^7 + 14u^5 + 2u^4 - 17u^3 - 7u^2 + a + 4u + 6,$$
$$u^8 - 5u^6 - u^5 + 7u^4 + 4u^3 - 2u^2 - 4u - 1\rangle$$

* 4 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 68 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.** $\boldsymbol{I_1^u = \langle -114u^{14} - 108u^{13} + \cdots + 299b - 79,\ 310u^{14} + 215u^{13} + \cdots + 299a - 593,\ u^{15} - 8u^{13} + \cdots + u + 1\rangle}$

**(i) Arc colorings**

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

$$a_{12} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

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

$$a_4 = \begin{pmatrix} -1.03679u^{14} - 0.719064u^{13} + \cdots - 0.645485u + 1.98328 \\ 0.381271u^{14} + 0.361204u^{13} + \cdots - 2.40134u + 0.264214 \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} -1.03679u^{14} - 0.719064u^{13} + \cdots - 0.645485u + 1.98328 \\ 0.381271u^{14} + 0.361204u^{13} + \cdots - 2.40134u + 0.264214 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} -0.655518u^{14} - 0.357860u^{13} + \cdots - 3.04682u + 2.24749 \\ 0.381271u^{14} + 0.361204u^{13} + \cdots - 2.40134u + 0.264214 \end{pmatrix}$$

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

$$a_7 = \begin{pmatrix} -0.277592u^{14} + 0.210702u^{13} + \cdots - 4.23411u - 0.762542 \\ -0.571906u^{14} - 0.541806u^{13} + \cdots + 0.602007u + 0.103679 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} -0.381271u^{14} - 0.361204u^{13} + \cdots + 2.40134u - 1.26421 \\ 0.224080u^{14} + 0.107023u^{13} + \cdots + 1.65886u - 0.625418 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} -0.719064u^{14} - 1.41806u^{13} + \cdots + 4.02007u + 1.03679 \\ 0.361204u^{14} + 0.605351u^{13} + \cdots + 0.882943u - 0.381271 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} -0.625418u^{14} - 0.224080u^{13} + \cdots - 2.97324u + 1.71572 \\ 0.518395u^{14} + 0.859532u^{13} + \cdots - 3.17726u - 0.491639 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -\frac{1039}{299}u^{14} - \frac{465}{299}u^{13} + \cdots + \frac{3706}{299}u + \frac{1512}{299}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{15} - 12u^{14} + \cdots + 352u - 16$ |
| $c_2, c_7$ | $u^{15} - u^{14} + \cdots - 9u + 1$ |
| $c_3, c_6$ | $u^{15} - 6u^{13} + \cdots - 2u + 1$ |
| $c_4, c_5, c_8$<br>$c_9, c_{10}, c_{12}$ | $u^{15} - 8u^{13} + 25u^{11} - 33u^9 + 2u^7 - u^6 + 37u^5 + 2u^4 - 27u^3 - u^2 + u + 1$ |
| $c_{11}$ | $u^{15} + 8u^{14} + \cdots + 2u - 4$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{15} - 2y^{14} + \cdots + 81824y - 256$ |
| $c_2, c_7$ | $y^{15} + 15y^{14} + \cdots + 13y - 1$ |
| $c_3, c_6$ | $y^{15} - 12y^{14} + \cdots + 38y - 1$ |
| $c_4, c_5, c_8$<br>$c_9, c_{10}, c_{12}$ | $y^{15} - 16y^{14} + \cdots + 3y - 1$ |
| $c_{11}$ | $y^{15} - 2y^{14} + \cdots + 332y - 16$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.012566 + 0.990836I$<br>$a = -0.211019 + 0.142592I$<br>$b = -1.41460 + 0.28782I$ | $-8.15802 + 4.15828I$ | $1.85862 - 2.84983I$ |
| $u = 0.012566 - 0.990836I$<br>$a = -0.211019 - 0.142592I$<br>$b = -1.41460 - 0.28782I$ | $-8.15802 - 4.15828I$ | $1.85862 + 2.84983I$ |
| $u = 1.169430 + 0.063677I$<br>$a = 0.64821 + 2.11508I$<br>$b = -0.920632 - 0.865411I$ | $3.87319 - 2.68365I$ | $10.95805 + 3.07423I$ |
| $u = 1.169430 - 0.063677I$<br>$a = 0.64821 - 2.11508I$<br>$b = -0.920632 + 0.865411I$ | $3.87319 + 2.68365I$ | $10.95805 - 3.07423I$ |
| $u = -1.246380 + 0.258821I$<br>$a = 0.538407 - 0.957075I$<br>$b = -0.644440 + 0.812972I$ | $6.72141 - 1.91087I$ | $13.27233 + 1.33121I$ |
| $u = -1.246380 - 0.258821I$<br>$a = 0.538407 + 0.957075I$<br>$b = -0.644440 - 0.812972I$ | $6.72141 + 1.91087I$ | $13.27233 - 1.33121I$ |
| $u = -1.43453$<br>$a = 0.152509$<br>$b = -1.16134$ | $8.30719$ | $10.1930$ |
| $u = -1.45450 + 0.38452I$<br>$a = -0.85460 - 1.15788I$<br>$b = 1.122180 + 0.164567I$ | $1.22162 - 5.77031I$ | $7.48274 + 3.55671I$ |
| $u = -1.45450 - 0.38452I$<br>$a = -0.85460 + 1.15788I$<br>$b = 1.122180 - 0.164567I$ | $1.22162 + 5.77031I$ | $7.48274 - 3.55671I$ |
| $u = 1.45202 + 0.46014I$<br>$a = -0.49137 + 1.50243I$<br>$b = 1.44823 - 0.69051I$ | $1.2931 + 14.7754I$ | $9.28197 - 7.69335I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.45202 - 0.46014I$<br>$a = -0.49137 - 1.50243I$<br>$b = 1.44823 + 0.69051I$ | $1.2931 - 14.7754I$ | $9.28197 + 7.69335I$ |
| $u = 1.54559$<br>$a = -0.962536$<br>$b = 0.336815$ | $14.2541$ | $21.6380$ |
| $u = 0.391264$<br>$a = 0.943881$<br>$b = -0.200615$ | $0.640876$ | $15.5990$ |
| $u = -0.184294 + 0.258098I$<br>$a = 1.80344 - 0.62550I$<br>$b = 0.921833 - 0.474362I$ | $-1.74796 + 1.39281I$ | $-0.06858 - 4.56854I$ |
| $u = -0.184294 - 0.258098I$<br>$a = 1.80344 + 0.62550I$<br>$b = 0.921833 + 0.474362I$ | $-1.74796 - 1.39281I$ | $-0.06858 + 4.56854I$ |

**II.**
$\boldsymbol{I_2^u = \langle 1.66\times 10^{32}u^{39}+3.60\times 10^{32}u^{38}+\cdots+2.03\times 10^{33}b+3.24\times 10^{33},\ -2.31\times 10^{33}u^{39}-2.80\times 10^{33}u^{38}+\cdots+1.42\times 10^{34}a-3.28\times 10^{34},\ u^{40}-u^{39}+\cdots+2u-7\rangle}$

**(i) Arc colorings**

$$a_9 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} 1 \\ -u^2 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} 0.161987u^{39} + 0.196985u^{38} + \cdots - 3.44398u + 2.30009 \\ -0.0813887u^{39} - 0.176820u^{38} + \cdots - 0.179851u - 1.59203 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} u \\ -u^3 + u \end{pmatrix}$$
$$a_5 = \begin{pmatrix} -0.163111u^{39} + 0.121091u^{38} + \cdots - 2.45449u - 0.157285 \\ 0.0118001u^{39} - 0.161041u^{38} + \cdots + 2.28334u - 1.24246 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} 0.0805980u^{39} + 0.0201647u^{38} + \cdots - 3.62383u + 0.708055 \\ -0.0813887u^{39} - 0.176820u^{38} + \cdots - 0.179851u - 1.59203 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} -u \\ u \end{pmatrix}$$
$$a_7 = \begin{pmatrix} -0.686240u^{39} + 0.165773u^{38} + \cdots - 8.36308u - 2.07268 \\ -0.124536u^{39} - 0.0137535u^{38} + \cdots + 3.30823u - 1.30076 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} -0.264297u^{39} + 0.208180u^{38} + \cdots - 8.40248u + 1.25906 \\ -0.0917954u^{39} - 0.149519u^{38} + \cdots + 1.01878u - 1.41043 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} 0.362372u^{39} - 0.240314u^{38} + \cdots + 6.14938u - 0.500854 \\ 0.0561169u^{39} + 0.187756u^{38} + \cdots - 1.78765u + 1.85008 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} 0.606180u^{39} + 0.0186776u^{38} + \cdots + 5.88374u + 4.45545 \\ 0.100110u^{39} - 0.0338163u^{38} + \cdots - 1.25499u - 0.588358 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 0.718225u^{39} + 0.557029u^{38} + \cdots - 30.2068u + 28.6614$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $(u^{20}+7u^{19}+\cdots-3u-1)^2$ |
| $c_2, c_7$ | $u^{40}-2u^{39}+\cdots-26u-61$ |
| $c_3, c_6$ | $u^{40}+2u^{39}+\cdots-228u-23$ |
| $c_4, c_5, c_8$<br>$c_9, c_{10}, c_{12}$ | $u^{40}-u^{39}+\cdots+2u-7$ |
| $c_{11}$ | $(u^{20}-3u^{19}+\cdots+3u-1)^2$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $(y^{20} + 3y^{19} + \cdots + 13y + 1)^2$ |
| $c_2, c_7$ | $y^{40} + 30y^{39} + \cdots + 71304y + 3721$ |
| $c_3, c_6$ | $y^{40} - 28y^{39} + \cdots - 27282y + 529$ |
| $c_4, c_5, c_8$ <br> $c_9, c_{10}, c_{12}$ | $y^{40} - 31y^{39} + \cdots - 144y + 49$ |
| $c_{11}$ | $(y^{20} - y^{19} + \cdots + 5y + 1)^2$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.172284 + 0.930618I$<br>$a = 0.563522 - 0.356753I$<br>$b = 0.782168 + 0.436510I$ | $2.10225 - 1.91320I$ | $12.94560 + 2.54574I$ |
| $u = 0.172284 - 0.930618I$<br>$a = 0.563522 + 0.356753I$<br>$b = 0.782168 - 0.436510I$ | $2.10225 + 1.91320I$ | $12.94560 - 2.54574I$ |
| $u = -0.244911 + 1.046600I$<br>$a = -0.233171 + 0.381855I$<br>$b = -1.38627 - 0.42735I$ | $-4.04482 - 9.38865I$ | $5.79523 + 6.34367I$ |
| $u = -0.244911 - 1.046600I$<br>$a = -0.233171 - 0.381855I$<br>$b = -1.38627 + 0.42735I$ | $-4.04482 + 9.38865I$ | $5.79523 - 6.34367I$ |
| $u = 1.066340 + 0.174534I$<br>$a = 0.33370 - 1.70053I$<br>$b = 0.655937 + 0.084213I$ | $2.98449 + 4.45164I$ | $7.31119 - 2.95218I$ |
| $u = 1.066340 - 0.174534I$<br>$a = 0.33370 + 1.70053I$<br>$b = 0.655937 - 0.084213I$ | $2.98449 - 4.45164I$ | $7.31119 + 2.95218I$ |
| $u = 0.233487 + 0.859274I$<br>$a = -0.065996 - 0.829336I$<br>$b = -1.398940 - 0.116446I$ | $-4.18215 + 1.22248I$ | $3.92149 - 1.39446I$ |
| $u = 0.233487 - 0.859274I$<br>$a = -0.065996 + 0.829336I$<br>$b = -1.398940 + 0.116446I$ | $-4.18215 - 1.22248I$ | $3.92149 + 1.39446I$ |
| $u = -1.14094$<br>$a = -0.265310$<br>$b = 1.65585$ | $9.37112$ | $7.59830$ |
| $u = 1.104630 + 0.381776I$<br>$a = -0.560979 + 1.119390I$<br>$b = 1.63716 - 0.52448I$ | $-1.57771 + 3.26749I$ | $7.04002 - 3.73668I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.104630 - 0.381776I$<br>$a = -0.560979 - 1.119390I$<br>$b = 1.63716 + 0.52448I$ | $-1.57771 - 3.26749I$ | $7.04002 + 3.73668I$ |
| $u = -1.156520 + 0.322107I$<br>$a = 0.14951 + 1.66461I$<br>$b = -1.029110 - 0.644604I$ | $1.13469 - 4.44881I$ | $7.43323 + 7.56778I$ |
| $u = -1.156520 - 0.322107I$<br>$a = 0.14951 - 1.66461I$<br>$b = -1.029110 + 0.644604I$ | $1.13469 + 4.44881I$ | $7.43323 - 7.56778I$ |
| $u = 1.207880 + 0.090529I$<br>$a = 0.50967 - 1.69237I$<br>$b = -0.68428 + 1.42821I$ | $2.10225 + 1.91320I$ | $12.94560 - 2.54574I$ |
| $u = 1.207880 - 0.090529I$<br>$a = 0.50967 + 1.69237I$<br>$b = -0.68428 - 1.42821I$ | $2.10225 - 1.91320I$ | $12.94560 + 2.54574I$ |
| $u = 1.223790 + 0.228666I$<br>$a = 0.77947 - 1.20408I$<br>$b = -1.28524 + 0.61663I$ | $1.41622 + 1.68884I$ | $7.49070 + 2.96681I$ |
| $u = 1.223790 - 0.228666I$<br>$a = 0.77947 + 1.20408I$<br>$b = -1.28524 - 0.61663I$ | $1.41622 - 1.68884I$ | $7.49070 - 2.96681I$ |
| $u = 0.441449 + 0.571825I$<br>$a = 1.29994 - 0.84693I$<br>$b = 0.259428 - 0.080723I$ | $1.41622 - 1.68884I$ | $7.49070 - 2.96681I$ |
| $u = 0.441449 - 0.571825I$<br>$a = 1.29994 + 0.84693I$<br>$b = 0.259428 + 0.080723I$ | $1.41622 + 1.68884I$ | $7.49070 + 2.96681I$ |
| $u = -1.068460 + 0.761321I$<br>$a = -0.426555 - 0.520491I$<br>$b = 1.176790 - 0.196349I$ | $-1.57771 + 3.26749I$ | $7.04002 - 3.73668I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.068460 - 0.761321I$<br>$a = -0.426555 + 0.520491I$<br>$b = 1.176790 + 0.196349I$ | $-1.57771 - 3.26749I$ | $7.04002 + 3.73668I$ |
| $u = -1.313800 + 0.233184I$<br>$a = -0.19963 + 1.86651I$<br>$b = 0.01842 - 1.57786I$ | $5.71544 - 7.22344I$ | $12.4528 + 8.0152I$ |
| $u = -1.313800 - 0.233184I$<br>$a = -0.19963 - 1.86651I$<br>$b = 0.01842 + 1.57786I$ | $5.71544 + 7.22344I$ | $12.4528 - 8.0152I$ |
| $u = -0.615450 + 0.236917I$<br>$a = 0.579816 + 1.206680I$<br>$b = 0.497229 + 0.198466I$ | $-2.02990 - 1.39321I$ | $1.85435 + 4.74860I$ |
| $u = -0.615450 - 0.236917I$<br>$a = 0.579816 - 1.206680I$<br>$b = 0.497229 - 0.198466I$ | $-2.02990 + 1.39321I$ | $1.85435 - 4.74860I$ |
| $u = -1.310930 + 0.483541I$<br>$a = -0.52543 - 1.34527I$<br>$b = 1.53654 + 0.62806I$ | $-4.04482 - 9.38865I$ | $6.00000 + 6.34367I$ |
| $u = -1.310930 - 0.483541I$<br>$a = -0.52543 + 1.34527I$<br>$b = 1.53654 - 0.62806I$ | $-4.04482 + 9.38865I$ | $6.00000 - 6.34367I$ |
| $u = 1.303490 + 0.504837I$<br>$a = -0.10836 - 1.48082I$<br>$b = -0.964074 + 0.616530I$ | $5.71544 + 7.22344I$ | $12.4528 - 8.0152I$ |
| $u = 1.303490 - 0.504837I$<br>$a = -0.10836 + 1.48082I$<br>$b = -0.964074 - 0.616530I$ | $5.71544 - 7.22344I$ | $12.4528 + 8.0152I$ |
| $u = 0.094199 + 0.593079I$<br>$a = 0.485794 + 0.531586I$<br>$b = 1.262160 - 0.290729I$ | $-2.02990 + 1.39321I$ | $1.85435 - 4.74860I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.094199 - 0.593079I$<br>$a = 0.485794 - 0.531586I$<br>$b = 1.262160 + 0.290729I$ | $-2.02990 - 1.39321I$ | $1.85435 + 4.74860I$ |
| $u = 1.300120 + 0.527949I$<br>$a = -0.636468 + 0.928959I$<br>$b = 1.152670 - 0.013361I$ | $-4.18215 + 1.22248I$ | $6.00000 + 0.I$ |
| $u = 1.300120 - 0.527949I$<br>$a = -0.636468 - 0.928959I$<br>$b = 1.152670 + 0.013361I$ | $-4.18215 - 1.22248I$ | $6.00000 + 0.I$ |
| $u = -1.40763 + 0.26008I$<br>$a = 0.90351 + 1.65797I$<br>$b = -1.28489 - 0.83804I$ | $2.98449 - 4.45164I$ | $0$ |
| $u = -1.40763 - 0.26008I$<br>$a = 0.90351 - 1.65797I$<br>$b = -1.28489 + 0.83804I$ | $2.98449 + 4.45164I$ | $0$ |
| $u = 0.166400 + 0.503509I$<br>$a = -0.865523 + 0.582383I$<br>$b = 0.297685 - 1.021220I$ | $1.13469 + 4.44881I$ | $7.43323 - 7.56778I$ |
| $u = 0.166400 - 0.503509I$<br>$a = -0.865523 - 0.582383I$<br>$b = 0.297685 + 1.021220I$ | $1.13469 - 4.44881I$ | $7.43323 + 7.56778I$ |
| $u = -0.461471$<br>$a = 3.17311$<br>$b = -0.944216$ | $7.33107$ | $23.9120$ |
| $u = -1.58819$<br>$a = 0.0220772$<br>$b = -0.324173$ | $7.33107$ | $0$ |
| $u = 1.79789$<br>$a = 0.675888$<br>$b = -0.874248$ | $9.37112$ | $0$ |

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

**(i) Arc colorings**

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

$$a_{12} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

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

$$a_4 = \begin{pmatrix} -u^4 + u^3 + 2u^2 - u \\ -u^3 + 2u \end{pmatrix}$$

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

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

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

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

$$a_7 = \begin{pmatrix} -u^2 \\ u^4 - 2u^2 + 1 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} -u^4 - u^3 + 2u^2 + 2u - 1 \\ u + 1 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} -u^4 + u^2 - u + 1 \\ u^4 + u^3 - 2u^2 - u + 1 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} -u^4 + 2u^3 + u^2 - u + 1 \\ -2u^3 + 3u - 1 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 4u^3 - 4u^2 - 9u + 13$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^5 - 7u^4 + 23u^3 - 41u^2 + 36u - 13$ |
| $c_2, c_7$ | $u^5 + u^4 + 3u^3 + 3u^2 + 2u + 1$ |
| $c_3, c_6$ | $u^5 - u^3 + u^2 + u - 1$ |
| $c_4, c_5, c_8$ <br> $c_9$ | $u^5 - 3u^3 + 2u + 1$ |
| $c_{10}, c_{12}$ | $u^5 - 3u^3 + 2u - 1$ |
| $c_{11}$ | $u^5 - 3u^4 + 3u^3 - 3u^2 + 2u - 1$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^5 - 3y^4 + 27y^3 - 207y^2 + 230y - 169$ |
| $c_2, c_7$ | $y^5 + 5y^4 + 7y^3 + y^2 - 2y - 1$ |
| $c_3, c_6$ | $y^5 - 2y^4 + 3y^3 - 3y^2 + 3y - 1$ |
| $c_4, c_5, c_8$<br>$c_9, c_{10}, c_{12}$ | $y^5 - 6y^4 + 13y^3 - 12y^2 + 4y - 1$ |
| $c_{11}$ | $y^5 - 3y^4 - 5y^3 - 3y^2 - 2y - 1$ |

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

| Solutions to $I_3^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.297630 + 0.272489I$<br>$a = \quad 0.53019 + 1.94593I$<br>$b = -0.699311 - 0.811268I$ | $4.27168 - 5.69445I$ | $10.65653 + 5.80129I$ |
| $u = -1.297630 - 0.272489I$<br>$a = \quad 0.53019 - 1.94593I$<br>$b = -0.699311 + 0.811268I$ | $4.27168 + 5.69445I$ | $10.65653 - 5.80129I$ |
| $u = \quad 0.516079 + 0.312340I$<br>$a = -0.116662 + 0.442697I$<br>$b = \quad 1.045750 + 0.405588I$ | $-1.28936 - 0.85728I$ | $7.62581 - 3.22423I$ |
| $u = \quad 0.516079 - 0.312340I$<br>$a = -0.116662 - 0.442697I$<br>$b = \quad 1.045750 - 0.405588I$ | $-1.28936 + 0.85728I$ | $7.62581 + 3.22423I$ |
| $u = \quad 1.56310$<br>$a = \quad 1.17294$<br>$b = -0.692872$ | 13.7746 | 4.43530 |

**IV.** $\boldsymbol{I_4^u = \langle u^7 - 4u^5 - u^4 + 3u^3 + 3u^2 + b + u - 1,\ -3u^7 + 14u^5 + \cdots + a + 6,\ u^8 - 5u^6 - u^5 + 7u^4 + 4u^3 - 2u^2 - 4u - 1\rangle}$

**(i) Arc colorings**

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

$$a_{12} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

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

$$a_4 = \begin{pmatrix} 3u^7 - 14u^5 - 2u^4 + 17u^3 + 7u^2 - 4u - 6 \\ -u^7 + 4u^5 + u^4 - 3u^3 - 3u^2 - u + 1 \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} 2u^7 - 10u^5 - u^4 + 13u^3 + 4u^2 - 3u - 5 \\ -u^7 + 5u^5 + u^4 - 6u^3 - 3u^2 + u + 2 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 2u^7 - 10u^5 - u^4 + 14u^3 + 4u^2 - 5u - 5 \\ -u^7 + 4u^5 + u^4 - 3u^3 - 3u^2 - u + 1 \end{pmatrix}$$

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

$$a_7 = \begin{pmatrix} -2u^7 + u^6 + 9u^5 - 3u^4 - 11u^3 - u^2 + 3u + 6 \\ u^7 - 4u^5 - u^4 + 4u^3 + 3u^2 - u - 2 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} -3u^7 + u^6 + 15u^5 - 2u^4 - 22u^3 - 5u^2 + 9u + 10 \\ u^7 - u^6 - 4u^5 + 3u^4 + 5u^3 - 3u - 3 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 3u^7 - u^6 - 14u^5 + u^4 + 18u^3 + 7u^2 - 6u - 9 \\ -u^7 + 5u^5 + u^4 - 7u^3 - 3u^2 + 2u + 3 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} 2u^7 + u^6 - 9u^5 - 5u^4 + 10u^3 + 7u^2 - 2u - 3 \\ -u^7 - u^6 + 4u^5 + 4u^4 - 2u^3 - 4u^2 - 3u \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 8u^7 - 32u^5 - 8u^4 + 32u^3 + 24u^2 - 8u - 8$

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

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

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $(y^4 + y^3 + y^2 - 3y + 1)^2$ |
| $c_2, c_7$ | $y^8 - y^7 + 2y^6 - 19y^5 + 16y^4 + 7y^3 + 16y^2 - 24y + 1$ |
| $c_3, c_6$ | $y^8 - 7y^7 + 27y^6 - 70y^5 + 101y^4 - 81y^3 + 39y^2 - 10y + 1$ |
| $c_4, c_5, c_8$<br>$c_9, c_{10}, c_{12}$ | $y^8 - 10y^7 + 39y^6 - 75y^5 + 75y^4 - 42y^3 + 22y^2 - 12y + 1$ |
| $c_{11}$ | $(y^4 - 3y^3 + y^2 + y + 1)^2$ |

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

| Solutions to $I_4^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.220530 + 0.143929I$<br>$a = 0.91993 - 1.73081I$<br>$b = -1.36577 + 1.02316I$ | $1.21622 + 2.52742I$ | $5.33661 - 5.36615I$ |
| $u = 1.220530 - 0.143929I$<br>$a = 0.91993 + 1.73081I$<br>$b = -1.36577 - 1.02316I$ | $1.21622 - 2.52742I$ | $5.33661 + 5.36615I$ |
| $u = -0.475131 + 0.605600I$<br>$a = 1.42534 + 0.16678I$<br>$b = 0.698689 - 0.352393I$ | $1.21622 + 2.52742I$ | $5.33661 - 5.36615I$ |
| $u = -0.475131 - 0.605600I$<br>$a = 1.42534 - 0.16678I$<br>$b = 0.698689 + 0.352393I$ | $1.21622 - 2.52742I$ | $5.33661 + 5.36615I$ |
| $u = -1.26429$<br>$a = 0.514662$<br>$b = -1.67103$ | $10.2678$ | $17.4300$ |
| $u = -1.63636$<br>$a = 0.469455$<br>$b = -0.596060$ | $7.03897$ | $-4.10300$ |
| $u = -0.313425$<br>$a = -4.55992$<br>$b = 1.10894$ | $7.03897$ | $-4.10300$ |
| $u = 1.72328$<br>$a = -0.114719$<br>$b = -0.507696$ | $10.2678$ | $17.4300$ |

## V. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $(u^4 - u^3 + u^2 + u - 1)^2(u^5 - 7u^4 + 23u^3 - 41u^2 + 36u - 13)$<br>$\cdot\,(u^{15} - 12u^{14} + \cdots + 352u - 16)(u^{20} + 7u^{19} + \cdots - 3u - 1)^2$ |
| $c_2, c_7$ | $(u^5 + u^4 + 3u^3 + 3u^2 + 2u + 1)(u^8 - u^7 + \cdots - 4u - 1)$<br>$\cdot\,(u^{15} - u^{14} + \cdots - 9u + 1)(u^{40} - 2u^{39} + \cdots - 26u - 61)$ |
| $c_3, c_6$ | $(u^5 - u^3 + u^2 + u - 1)(u^8 - 3u^7 + \cdots + 2u - 1)$<br>$\cdot\,(u^{15} - 6u^{13} + \cdots - 2u + 1)(u^{40} + 2u^{39} + \cdots - 228u - 23)$ |
| $c_4, c_5, c_8$<br>$c_9$ | $(u^5 - 3u^3 + 2u + 1)(u^8 - 5u^6 + u^5 + 7u^4 - 4u^3 - 2u^2 + 4u - 1)$<br>$\cdot\,(u^{15} - 8u^{13} + 25u^{11} - 33u^9 + 2u^7 - u^6 + 37u^5 + 2u^4 - 27u^3 - u^2 + u + 1)$<br>$\cdot\,(u^{40} - u^{39} + \cdots + 2u - 7)$ |
| $c_{10}, c_{12}$ | $(u^5 - 3u^3 + 2u - 1)(u^8 - 5u^6 - u^5 + 7u^4 + 4u^3 - 2u^2 - 4u - 1)$<br>$\cdot\,(u^{15} - 8u^{13} + 25u^{11} - 33u^9 + 2u^7 - u^6 + 37u^5 + 2u^4 - 27u^3 - u^2 + u + 1)$<br>$\cdot\,(u^{40} - u^{39} + \cdots + 2u - 7)$ |
| $c_{11}$ | $(u^4 + u^3 - u^2 - u - 1)^2(u^5 - 3u^4 + 3u^3 - 3u^2 + 2u - 1)$<br>$\cdot\,(u^{15} + 8u^{14} + \cdots + 2u - 4)(u^{20} - 3u^{19} + \cdots + 3u - 1)^2$ |

## VI. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $(y^4+y^3+y^2-3y+1)^2(y^5-3y^4+27y^3-207y^2+230y-169)$ $\cdot(y^{15}-2y^{14}+\cdots+81824y-256)(y^{20}+3y^{19}+\cdots+13y+1)^2$ |
| $c_2, c_7$ | $(y^5+5y^4+7y^3+y^2-2y-1)$ $\cdot(y^8-y^7+2y^6-19y^5+16y^4+7y^3+16y^2-24y+1)$ $\cdot(y^{15}+15y^{14}+\cdots+13y-1)(y^{40}+30y^{39}+\cdots+71304y+3721)$ |
| $c_3, c_6$ | $(y^5-2y^4+3y^3-3y^2+3y-1)$ $\cdot(y^8-7y^7+27y^6-70y^5+101y^4-81y^3+39y^2-10y+1)$ $\cdot(y^{15}-12y^{14}+\cdots+38y-1)(y^{40}-28y^{39}+\cdots-27282y+529)$ |
| $c_4, c_5, c_8$ $c_9, c_{10}, c_{12}$ | $(y^5-6y^4+13y^3-12y^2+4y-1)$ $\cdot(y^8-10y^7+39y^6-75y^5+75y^4-42y^3+22y^2-12y+1)$ $\cdot(y^{15}-16y^{14}+\cdots+3y-1)(y^{40}-31y^{39}+\cdots-144y+49)$ |
| $c_{11}$ | $(y^4-3y^3+y^2+y+1)^2(y^5-3y^4-5y^3-3y^2-2y-1)$ $\cdot(y^{15}-2y^{14}+\cdots+332y-16)(y^{20}-y^{19}+\cdots+5y+1)^2$ |