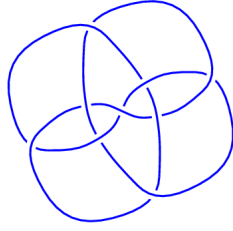
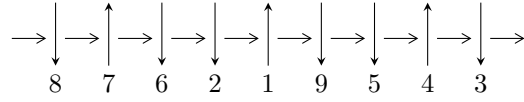


9₄₀ (K9a₃₇)

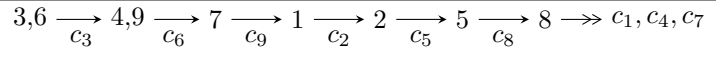


1

Arc Sequences



Solving Sequence



Representation Ideals

$$I = \bigcap_{i=1}^{15} I_i^u \bigcap I_1^v$$

- $I_1^u = \langle u^2 - u + 1, a, b - u \rangle$
- $I_2^u = \langle u^2 - u + 1, b - u, a + u - 2 \rangle$
- $I_3^u = \langle u^2 + 3u + 3, 3a + u, b + u + 1 \rangle$
- $I_4^u = \langle u^4 - u^3 + 2u + 1, -u^3 + u^2 + a - 2, u^3 - 2u^2 + b + 2u + 1 \rangle$
- $I_5^u = \langle b^4 - b^3 + 2b + 1, u - 1, -b^3 + 2b^2 - 2b + a - 1 \rangle$
- $I_6^u = \langle u^4 - u^3 + 2u + 1, b - 1, u^3 - 2u^2 + a + 2u \rangle$
- $I_7^u = \langle u^4 - u^3 + 2u + 1, b - u, 4u^3 - 6u^2 + a + 3u + 6 \rangle$
- $I_8^u = \langle u^4 + 5u^3 + 12u^2 + 14u + 7, u^3 + 3u^2 + b + 5u + 2, 2u^3 + 3u^2 + 7a + 3u - 7 \rangle$
- $I_9^u = \langle u - 1, a + 1, b + 1 \rangle$
- $I_{10}^u = \langle u^2 + u + 1, a + 1, b - u \rangle$

¹The knot diagram image is adapter from “C. Livingston and A. H. Moore, KnotInfo: Table of Knot Invariants, <http://www.indiana.edu/~knotinfo>”

$$\begin{aligned}
I_{11}^u &= \langle u^4 - u^3 + u + 1, a + 1, b + u \rangle \\
I_{12}^u &= \langle u^4 - u^3 + 2u + 1, a + 1, 2u^3 - 3u^2 + b + 2u + 4 \rangle \\
I_{13}^u &= \langle u^4 + 2u^3 + 2u^2 + 1, a + 1, b - u \rangle \\
I_{14}^u &= \langle u^2 - u + 1, b, a + 1 \rangle \\
I_{15}^u &= \langle u^2 - u + 1, a + 1, b + u + 1 \rangle \\
I_1^v &= \langle v - 1, b^2 - b + 1, a \rangle
\end{aligned}$$

There are 16 irreducible components with 47 representations.

$$\mathbf{I. } I_1^u = \langle u^2 - u + 1, a, b - u \rangle$$

(i) Arc colorings

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

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

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

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

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

$$a_1 = \begin{pmatrix} -u \\ u \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} 1 \\ u - 1 \end{pmatrix}$$

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

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

(ii) Obstruction class = -1

(iii) Cusp Shapes = $4u - 2$

(iv) Complex Volumes and Cusp Shapes

	Solution to I_1^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u =$	$0.500000 - 0.866025I$	$2.02988I$	$- 3.46410I$
$a =$	0		
$b =$	$0.500000 - 0.866025I$		
$u =$	$0.500000 + 0.866025I$	$- 2.02988I$	$3.46410I$
$a =$	0		
$b =$	$0.500000 + 0.866025I$		

$$\text{II. } I_2^u = \langle u^2 - u + 1, b - u, a + u - 2 \rangle$$

(i) Arc colorings

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

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

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

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

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

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

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

$$a_5 = \begin{pmatrix} 4u - 4 \\ -u \end{pmatrix}$$

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

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

(ii) Obstruction class = -1

(iii) Cusp Shapes = $12u - 6$

(iv) Complex Volumes and Cusp Shapes

	Solution to I_2^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u =$	$0.500000 - 0.866025I$		
$a =$	$1.50000 + 0.86603I$	$6.08965I$	$- 10.3923I$
$b =$	$0.500000 - 0.866025I$		
$u =$	$0.500000 + 0.866025I$		
$a =$	$1.50000 - 0.86603I$	$- 6.08965I$	$10.3923I$
$b =$	$0.500000 + 0.866025I$		

$$\text{III. } I_3^u = \langle u^2 + 3u + 3, 3a + u, b + u + 1 \rangle$$

(i) Arc colorings

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

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

$$a_4 = \begin{pmatrix} 1 \\ -3u - 3 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} -\frac{1}{3}u \\ -u - 1 \end{pmatrix}$$

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

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

$$a_2 = \begin{pmatrix} \frac{4}{3}u + 3 \\ 4 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} \frac{1}{3}u \\ u + 1 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -\frac{4}{3}u - 2 \\ -u - 4 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -\frac{4}{3}u - 2 \\ -u - 4 \end{pmatrix}$$

(ii) Obstruction class = -1

(iii) Cusp Shapes = $-12u - 18$

(iv) Complex Volumes and Cusp Shapes

Solution to I_3^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -1.50000 - 0.86603I$		
$a = 0.500000 + 0.288675I$	$-6.08965I$	$10.3923I$
$b = 0.500000 + 0.866025I$		
$u = -1.50000 + 0.86603I$		
$a = 0.500000 - 0.288675I$	$6.08965I$	$-10.3923I$
$b = 0.500000 - 0.866025I$		

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

(i) Arc colorings

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

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

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

$$a_9 = \begin{pmatrix} u^3 - u^2 + 2 \\ -u^3 + 2u^2 - 2u - 1 \end{pmatrix}$$

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

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

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

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

$$a_8 = \begin{pmatrix} 2u^3 - 3u^2 + u + 3 \\ -u^3 + u^2 - u \end{pmatrix}$$

$$a_8 = \begin{pmatrix} 2u^3 - 3u^2 + u + 3 \\ -u^3 + u^2 - u \end{pmatrix}$$

(ii) Obstruction class = -1

(iii) Cusp Shapes = $-4u^3 + 8u^2 - 4u - 18$

(iv) Complex Volumes and Cusp Shapes

Solution to I_4^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -0.621964 - 0.187730I$	$-3.28987 - 2.02988I$	$-12.00000 + 3.46410I$
$a = 1.47356 - 0.44477I$		
$b = 1.12196 + 1.05376I$		
$u = -0.621964 + 0.187730I$	$-3.28987 + 2.02988I$	$-12.00000 - 3.46410I$
$a = 1.47356 + 0.44477I$		
$b = 1.12196 - 1.05376I$		
$u = 1.12196 - 1.05376I$	$-3.28987 + 2.02988I$	$-12.00000 - 3.46410I$
$a = -0.473561 - 0.444772I$		
$b = -0.621964 + 0.187730I$		
$u = 1.12196 + 1.05376I$	$-3.28987 - 2.02988I$	$-12.00000 + 3.46410I$
$a = -0.473561 + 0.444772I$		
$b = -0.621964 - 0.187730I$		

$$\mathbf{V. } I_5^u = \langle b^4 - b^3 + 2b + 1, u - 1, -b^3 + 2b^2 - 2b + a - 1 \rangle$$

(i) Arc colorings

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

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

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

$$a_9 = \begin{pmatrix} b^3 - 2b^2 + 2b + 1 \\ b \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 3b^3 - 5b^2 + 3b + 4 \\ b^3 - 2b^2 + b + 2 \end{pmatrix}$$

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

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

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

$$a_8 = \begin{pmatrix} 2b^3 - 4b^2 + 3b + 2 \\ b^3 - 2b^2 + 2b + 1 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} 2b^3 - 4b^2 + 3b + 2 \\ b^3 - 2b^2 + 2b + 1 \end{pmatrix}$$

(ii) Obstruction class = -1

(iii) Cusp Shapes = $-4b^3 + 8b^2 - 4b - 18$

(iv) Complex Volumes and Cusp Shapes

Solution to I_5^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = 1.00000$ $a = -1.12196 - 1.05376I$ $b = -0.621964 - 0.187730I$	$-3.28987 - 2.02988I$	$-12.00000 + 3.46410I$
$u = 1.00000$ $a = -1.12196 + 1.05376I$ $b = -0.621964 + 0.187730I$	$-3.28987 + 2.02988I$	$-12.00000 - 3.46410I$
$u = 1.00000$ $a = 0.621964 - 0.187730I$ $b = 1.12196 - 1.05376I$	$-3.28987 + 2.02988I$	$-12.00000 - 3.46410I$
$u = 1.00000$ $a = 0.621964 + 0.187730I$ $b = 1.12196 + 1.05376I$	$-3.28987 - 2.02988I$	$-12.00000 + 3.46410I$

$$\text{VI. } I_6^u = \langle u^4 - u^3 + 2u + 1, b - 1, u^3 - 2u^2 + a + 2u \rangle$$

(i) Arc colorings

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

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

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

$$a_9 = \begin{pmatrix} -u^3 + 2u^2 - 2u \\ 1 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -4u^3 + 7u^2 - 5u - 5 \\ -u^3 + 2u^2 - u - 1 \end{pmatrix}$$

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

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

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

$$a_8 = \begin{pmatrix} -2u^3 + 4u^2 - 3u - 2 \\ -u \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -2u^3 + 4u^2 - 3u - 2 \\ -u \end{pmatrix}$$

(ii) Obstruction class = -1

(iii) Cusp Shapes = $-4u^3 + 8u^2 - 4u - 18$

(iv) Complex Volumes and Cusp Shapes

Solution to I_6^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -0.621964 - 0.187730I$ $a = 2.12196 + 1.05376I$ $b = 1.00000$	$-3.28987 - 2.02988I$	$-12.00000 + 3.46410I$
$u = -0.621964 + 0.187730I$ $a = 2.12196 - 1.05376I$ $b = 1.00000$	$-3.28987 + 2.02988I$	$-12.00000 - 3.46410I$
$u = 1.12196 - 1.05376I$ $a = 0.378036 + 0.187730I$ $b = 1.00000$	$-3.28987 + 2.02988I$	$-12.00000 - 3.46410I$
$u = 1.12196 + 1.05376I$ $a = 0.378036 - 0.187730I$ $b = 1.00000$	$-3.28987 - 2.02988I$	$-12.00000 + 3.46410I$

$$\text{VII. } I_7^u = \langle u^4 - u^3 + 2u + 1, b - u, 4u^3 - 6u^2 + a + 3u + 6 \rangle$$

(i) Arc colorings

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

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

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

$$a_9 = \begin{pmatrix} -4u^3 + 6u^2 - 3u - 6 \\ u \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 7u^3 - 12u^2 + 8u + 8 \\ u^3 - 2u^2 + u + 2 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} -4u^3 + 6u^2 - 4u - 6 \\ u \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} 4u^3 - 8u^2 + 8u + 4 \\ 2u^3 - 2u^2 + u + 2 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -5u^3 + 8u^2 - 4u - 8 \\ -1 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -5u^3 + 8u^2 - 4u - 8 \\ -1 \end{pmatrix}$$

(ii) Obstruction class = -1

(iii) Cusp Shapes = $-12u^3 + 24u^2 - 12u - 30$

(iv) Complex Volumes and Cusp Shapes

Solution to I_7^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -0.621964 - 0.187730I$		
$a = -1.32516 + 2.80932I$	$-3.28987 - 6.08965I$	$-12.0000 + 10.3923I$
$b = -0.621964 - 0.187730I$		
$u = -0.621964 + 0.187730I$		
$a = -1.32516 - 2.80932I$	$-3.28987 + 6.08965I$	$-12.0000 - 10.3923I$
$b = -0.621964 + 0.187730I$		
$u = 1.12196 - 1.05376I$		
$a = 0.825159 + 0.211249I$	$-3.28987 + 6.08965I$	$-12.0000 - 10.3923I$
$b = 1.12196 - 1.05376I$		
$u = 1.12196 + 1.05376I$		
$a = 0.825159 - 0.211249I$	$-3.28987 - 6.08965I$	$-12.0000 + 10.3923I$
$b = 1.12196 + 1.05376I$		

VIII.

$$I_8^u = \langle u^4 + 5u^3 + 12u^2 + 14u + 7, u^3 + 3u^2 + b + 5u + 2, 2u^3 + 3u^2 + 7a + 3u - 7 \rangle$$

(i) Arc colorings

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

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

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

$$a_9 = \begin{pmatrix} -\frac{2}{7}u^3 - \frac{3}{7}u^2 - \frac{3}{7}u + 1 \\ -u^3 - 3u^2 - 5u - 2 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -\frac{10}{7}u^3 - \frac{36}{7}u^2 - \frac{64}{7}u - 5 \\ -2u^3 - 8u^2 - 14u - 10 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} \frac{5}{7}u^3 + \frac{18}{7}u^2 + \frac{32}{7}u + 3 \\ -u^3 - 3u^2 - 5u - 2 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} \frac{2}{7}u^3 - \frac{4}{7}u^2 - \frac{18}{7}u - 5 \\ 4u^3 + 16u^2 + 28u + 16 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} \frac{4}{7}u^3 + \frac{13}{7}u^2 + \frac{20}{7}u + 1 \\ u^2 + 4u + 4 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -\frac{9}{7}u^3 - \frac{31}{7}u^2 - \frac{52}{7}u - 4 \\ -u^3 - 6u^2 - 12u - 9 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -\frac{9}{7}u^3 - \frac{31}{7}u^2 - \frac{52}{7}u - 4 \\ -u^3 - 6u^2 - 12u - 9 \end{pmatrix}$$

(ii) Obstruction class = -1

(iii) Cusp Shapes = $-12u^3 - 48u^2 - 84u - 66$

(iv) Complex Volumes and Cusp Shapes

Solution to I_g^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -1.35160 - 1.49853I$		
$a = -0.137346 + 0.291171I$	$-3.28987 + 6.08965I$	$-12.0000 - 10.3923I$
$b = -0.621964 + 0.187730I$		
$u = -1.35160 + 1.49853I$		
$a = -0.137346 - 0.291171I$	$-3.28987 - 6.08965I$	$-12.0000 + 10.3923I$
$b = -0.621964 - 0.187730I$		
$u = -1.148403 - 0.632502I$		
$a = 1.137346 + 0.291171I$	$-3.28987 - 6.08965I$	$-12.0000 + 10.3923I$
$b = 1.12196 + 1.05376I$		
$u = -1.148403 + 0.632502I$		
$a = 1.137346 - 0.291171I$	$-3.28987 + 6.08965I$	$-12.0000 - 10.3923I$
$b = 1.12196 - 1.05376I$		

$$\text{IX. } I_9^u = \langle u - 1, a + 1, b + 1 \rangle$$

(i) Arc colorings

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

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

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

$$a_9 = \begin{pmatrix} -1 \\ -1 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

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

$$a_2 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

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

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

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

(ii) Obstruction class = 1

(iii) Cusp Shapes = -12

(iv) Complex Volumes and Cusp Shapes

Solution to I_9^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = 1.00000$		
$a = -1.00000$	-3.28987	-12.0000
$b = -1.00000$		

$$\mathbf{X. } I_{10}^u = \langle u^2 + u + 1, a + 1, b - u \rangle$$

(i) Arc colorings

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

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

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

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

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

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

$$a_2 = \begin{pmatrix} u + 1 \\ 1 \end{pmatrix}$$

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

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

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

(ii) Obstruction class = -1

(iii) Cusp Shapes = 3

(iv) Complex Volumes and Cusp Shapes

Solution to I_{10}^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -0.500000 - 0.866025I$ $a = -1.00000$ $b = -0.500000 - 0.866025I$	3.28987	3.00000
$u = -0.500000 + 0.866025I$ $a = -1.00000$ $b = -0.500000 + 0.866025I$	3.28987	3.00000

$$\text{XI. } \Gamma_{11}^u = \langle u^4 - u^3 + u + 1, a + 1, b + u \rangle$$

(i) Arc colorings

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

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

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

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

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

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

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

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

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

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

(ii) Obstruction class = 1

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

(iv) Complex Volumes and Cusp Shapes

Solution to I_{11}^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -0.566121 - 0.458821I$ $a = -1.00000$ $b = 0.566121 + 0.458821I$	$-2.46740 + 5.33349I$	$-4.50000 - 3.96863I$
$u = -0.566121 + 0.458821I$ $a = -1.00000$ $b = 0.566121 - 0.458821I$	$-2.46740 - 5.33349I$	$-4.50000 + 3.96863I$
$u = 1.066121 - 0.864054I$ $a = -1.00000$ $b = -1.066121 + 0.864054I$	$-2.46740 + 5.33349I$	$-4.50000 - 3.96863I$
$u = 1.066121 + 0.864054I$ $a = -1.00000$ $b = -1.066121 - 0.864054I$	$-2.46740 - 5.33349I$	$-4.50000 + 3.96863I$

$$\text{XII. } I_{12}^u = \langle u^4 - u^3 + 2u + 1, a + 1, 2u^3 - 3u^2 + b + 2u + 4 \rangle$$

(i) Arc colorings

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

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

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

$$a_9 = \begin{pmatrix} -1 \\ -2u^3 + 3u^2 - 2u - 4 \end{pmatrix}$$

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

$$a_1 = \begin{pmatrix} 2u^3 - 3u^2 + 2u + 3 \\ -2u^3 + 3u^2 - 2u - 4 \end{pmatrix}$$

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

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

$$a_8 = \begin{pmatrix} 2u^3 - 4u^2 + 2u + 3 \\ -2u^3 + 3u^2 - 2 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} 2u^3 - 4u^2 + 2u + 3 \\ -2u^3 + 3u^2 - 2 \end{pmatrix}$$

(ii) Obstruction class = -1

(iii) Cusp Shapes = $-12u^3 + 24u^2 - 12u - 30$

(iv) Complex Volumes and Cusp Shapes

Solution to I_{12}^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -0.621964 - 0.187730I$ $a = -1.00000$ $b = -1.35160 + 1.49853I$	$-3.28987 - 6.08965I$	$-12.0000 + 10.3923I$
$u = -0.621964 + 0.187730I$ $a = -1.00000$ $b = -1.35160 - 1.49853I$	$-3.28987 + 6.08965I$	$-12.0000 - 10.3923I$
$u = 1.12196 - 1.05376I$ $a = -1.00000$ $b = -1.148403 + 0.632502I$	$-3.28987 + 6.08965I$	$-12.0000 - 10.3923I$
$u = 1.12196 + 1.05376I$ $a = -1.00000$ $b = -1.148403 - 0.632502I$	$-3.28987 - 6.08965I$	$-12.0000 + 10.3923I$

$$\text{XIII. } I_{13}^u = \langle u^4 + 2u^3 + 2u^2 + 1, a + 1, b - u \rangle$$

(i) Arc colorings

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

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

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

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

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

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

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

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

$$a_8 = \begin{pmatrix} -u^2 - u - 1 \\ u^3 + 2u^2 + u + 1 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -u^2 - u - 1 \\ u^3 + 2u^2 + u + 1 \end{pmatrix}$$

(ii) Obstruction class = -1

(iii) Cusp Shapes = $6u^2 + 6u$

(iv) Complex Volumes and Cusp Shapes

Solution to I_{13}^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -1.18978 - 1.04318I$ $a = -1.00000$ $b = -1.18978 - 1.04318I$	$-4.0034 - 15.0183I$	$-5.17459 + 8.63488I$
$u = -1.18978 + 1.04318I$ $a = -1.00000$ $b = -1.18978 + 1.04318I$	$-4.0034 + 15.0183I$	$-5.17459 - 8.63488I$
$u = 0.189785 - 0.602803I$ $a = -1.00000$ $b = 0.189785 - 0.602803I$	$-0.10892 + 1.69225I$	$-0.82541 - 4.98965I$
$u = 0.189785 + 0.602803I$ $a = -1.00000$ $b = 0.189785 + 0.602803I$	$-0.10892 - 1.69225I$	$-0.82541 + 4.98965I$

$$\text{XIV. } I_{14}^u = \langle u^2 - u + 1, b, a + 1 \rangle$$

(i) Arc colorings

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

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

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

$$a_9 = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -u \\ u \end{pmatrix}$$

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

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

$$a_5 = \begin{pmatrix} -u \\ u \end{pmatrix}$$

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

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

(ii) Obstruction class = -1

(iii) Cusp Shapes = $4u - 2$

(iv) Complex Volumes and Cusp Shapes

Solution to I_{14}^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = 0.500000 - 0.866025I$ $a = -1.00000$ $b = 0$	$2.02988I$	$-3.46410I$
$u = 0.500000 + 0.866025I$ $a = -1.00000$ $b = 0$	$-2.02988I$	$3.46410I$

$$\text{XV. } I_{15}^u = \langle u^2 - u + 1, a + 1, b + u + 1 \rangle$$

(i) Arc colorings

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

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

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

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

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

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

$$a_2 = \begin{pmatrix} 0 \\ -u \end{pmatrix}$$

$$a_5 = \begin{pmatrix} 1 \\ 2u - 2 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} 1 \\ u - 3 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} 1 \\ u - 3 \end{pmatrix}$$

(ii) Obstruction class = -1

(iii) Cusp Shapes = $12u - 6$

(iv) Complex Volumes and Cusp Shapes

Solution to I_{15}^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = 0.500000 - 0.866025I$ $a = -1.00000$ $b = -1.50000 + 0.86603I$	$6.08965I$	$-10.3923I$
$u = 0.500000 + 0.866025I$ $a = -1.00000$ $b = -1.50000 - 0.86603I$	$-6.08965I$	$10.3923I$

$$\text{XVI. } I_1^v = \langle v - 1, b^2 - b + 1, a \rangle$$

(i) Arc colorings

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

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

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

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

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

$$a_1 = \begin{pmatrix} -b \\ b \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} -b + 2 \\ b - 1 \end{pmatrix}$$

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

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

(ii) Obstruction class = -1

(iii) Cusp Shapes = $4b - 2$

(iv) Complex Volumes and Cusp Shapes

Solution to I_1^v	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$v = 1.00000$		
$a = 0$	$2.02988I$	$-3.46410I$
$b = 0.500000 - 0.866025I$		
$v = 1.00000$		
$a = 0$	$-2.02988I$	$3.46410I$
$b = 0.500000 + 0.866025I$		

XVII. u-Polynomials

Crossings	u-Polynomials at each crossings
c_1, c_4, c_7	$u^2(u+1)^5(u^2-3u+3)(u^2-u+1)(u^2+u+1)^4$ $(u^4-5u^3+\dots-14u+7)(u^4-2u^3+2u^2+1)(1-2u+u^3+u^4)^4$ (u^4+u^3-u+1)
c_2, c_5, c_8	$(u)(-2+u)^2(-1+u)^2(4-2u+u^2)^2(u^2-u+1)(1+u+u^2)^{14}(u^4+u^2+2)$ $(u^4-2u^3+4u^2-2u+2)$
c_3, c_6, c_9	$u^2(u-1)(u+1)^4(u^2-3u+3)(u^2-u+1)(u^2+u+1)^4$ $(u^4-5u^3+12u^2-14u+7)(u^4-2u^3+2u^2+1)(u^4-u^3+u+1)$ $(u^4+u^3-2u+1)^4$

XVIII. Riley Polynomials

Crossings	Riley Polynomials at each crossings
c_1, c_3, c_4 c_6, c_7, c_9	$y^2(y-1)^5(y^2-3y+9)(y^2+y+1)^5(y^4+6y^2+4y+1)$ $(y^4-y^3+4y^2-y+1)(y^4-y^3+6y^2-4y+1)^4$ $(y^4-y^3+18y^2-28y+49)$
c_2, c_5, c_8	$y(y-4)^2(y-1)^2(y^2+y+1)^{15}(y^2+y+2)^2(y^2+4y+16)^2$ $(y^4+4y^3+12y^2+12y+4)$