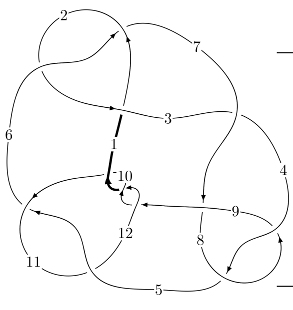
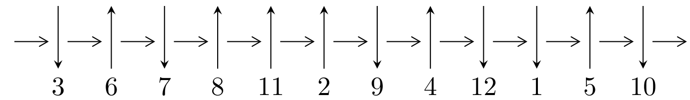
# $12a_{0207}$ ($K12a_{0207}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$I_1^u = \langle -1.51570 \times 10^{15} u^{34} - 5.53502 \times 10^{15} u^{33} + \cdots + 1.20230 \times 10^{15} b + 4.04644 \times 10^{15},$

$\quad 6.68182 \times 10^{15} u^{34} + 2.49675 \times 10^{16} u^{33} + \cdots + 4.80919 \times 10^{15} a - 2.62648 \times 10^{16},\ u^{35} + 5u^{34} + \cdots - 13u -$

$I_2^u = \langle -1763u^{28}a + 3881u^{28} + \cdots - 1262a + 2496,\ 29u^{28}a - 5u^{28} + \cdots + 5a + 39,\ u^{29} + 4u^{28} + \cdots + 2u + 1\rangle$

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

$I_4^u = \langle a^5 - a^4 - 3a^3 + 4a^2 + b + 4a - 2,\ a^6 - 2a^5 - a^4 + 5a^3 - 3a + 1,\ u - 1\rangle$

$I_5^u = \langle au + b + u + 1,\ a^2 + 2au + 4a + 4u + 7,\ u^2 + u - 1\rangle$

* 5 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 107 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.** $\boldsymbol{I_1^u = \langle -1.52 \times 10^{15} u^{34} - 5.54 \times 10^{15} u^{33} + \cdots + 1.20 \times 10^{15} b + 4.05 \times 10^{15},\ 6.68 \times 10^{15} u^{34} + 2.50 \times 10^{16} u^{33} + \cdots + 4.81 \times 10^{15} a - 2.63 \times 10^{16},\ u^{35} + 5u^{34} + \cdots - 13u - 4 \rangle}$

**(i) Arc colorings**

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

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

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

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

$$a_4 = \begin{pmatrix} -1.38939u^{34} - 5.19162u^{33} + \cdots + 16.4019u + 5.46137 \\ 1.26067u^{34} + 4.60371u^{33} + \cdots - 11.0154u - 3.36559 \end{pmatrix}$$

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

$$a_8 = \begin{pmatrix} -0.955888u^{34} - 3.63380u^{33} + \cdots + 10.9509u + 4.67994 \\ 1.37755u^{34} + 5.16666u^{33} + \cdots - 11.9980u - 4.33307 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} -1.18952u^{34} - 4.52016u^{33} + \cdots + 14.1974u + 5.74534 \\ 1.68537u^{34} + 6.13795u^{33} + \cdots - 14.5486u - 4.33555 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 0.421659u^{34} + 1.53286u^{33} + \cdots - 1.04716u + 0.346871 \\ 1.37755u^{34} + 5.16666u^{33} + \cdots - 11.9980u - 4.33307 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 0.507830u^{34} + 1.85439u^{33} + \cdots - 1.52833u - 0.397819 \\ 1.41127u^{34} + 5.28521u^{33} + \cdots - 12.6990u - 4.42566 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} -0.624564u^{34} - 2.20570u^{33} + \cdots + 1.73779u + 1.68599 \\ -0.299699u^{34} - 1.03425u^{33} + \cdots + 2.40823u + 0.469963 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 0.222426u^{34} + 0.604677u^{33} + \cdots + 3.42434u + 2.44151 \\ 1.45957u^{34} + 5.39478u^{33} + \cdots - 13.5630u - 4.01322 \end{pmatrix}$$

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

**(iii) Cusp Shapes**

$$= -\frac{286002733643823339}{9618382602850592}u^{34} - \frac{558665426051773373}{4809191301425296}u^{33} + \cdots + \frac{344438964453645221}{9618382602850592}u + \frac{381443474866153 97}{2404595650712648}$$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $u^{35} + 18u^{34} + \cdots - 9u - 1$ |
| $c_2, c_4, c_6$<br>$c_8$ | $u^{35} + 9u^{33} + \cdots - u - 1$ |
| $c_3$ | $u^{35} + 6u^{34} + \cdots + 64u - 64$ |
| $c_5, c_{11}$ | $u^{35} + 3u^{34} + \cdots - 112u + 64$ |
| $c_9, c_{10}, c_{12}$ | $u^{35} - 5u^{34} + \cdots - 13u + 4$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $y^{35} + 6y^{34} + \cdots + 3y - 1$ |
| $c_2, c_4, c_6$ $c_8$ | $y^{35} + 18y^{34} + \cdots - 9y - 1$ |
| $c_3$ | $y^{35} - 24y^{34} + \cdots - 57344y - 4096$ |
| $c_5, c_{11}$ | $y^{35} + 27y^{34} + \cdots - 7936y - 4096$ |
| $c_9, c_{10}, c_{12}$ | $y^{35} - 37y^{34} + \cdots - 175y - 16$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.959008 + 0.270609I$<br>$a = 0.823234 + 0.223651I$<br>$b = -0.173746 + 0.485732I$ | $-1.84314 - 0.87084I$ | $-4.62038 + 1.34519I$ |
| $u = 0.959008 - 0.270609I$<br>$a = 0.823234 - 0.223651I$<br>$b = -0.173746 - 0.485732I$ | $-1.84314 + 0.87084I$ | $-4.62038 - 1.34519I$ |
| $u = 0.512518 + 0.917994I$<br>$a = -1.70850 + 0.05834I$<br>$b = 0.517624 - 1.215310I$ | $-7.59221 - 11.92590I$ | $-6.11495 + 8.82041I$ |
| $u = 0.512518 - 0.917994I$<br>$a = -1.70850 - 0.05834I$<br>$b = 0.517624 + 1.215310I$ | $-7.59221 + 11.92590I$ | $-6.11495 - 8.82041I$ |
| $u = 0.954171 + 0.487790I$<br>$a = 0.010990 + 0.441890I$<br>$b = -0.416864 - 0.843498I$ | $-2.25613 + 2.35480I$ | $-4.42628 - 5.78689I$ |
| $u = 0.954171 - 0.487790I$<br>$a = 0.010990 - 0.441890I$<br>$b = -0.416864 + 0.843498I$ | $-2.25613 - 2.35480I$ | $-4.42628 + 5.78689I$ |
| $u = 0.721919 + 0.835340I$<br>$a = -0.372316 - 0.313834I$<br>$b = 0.476440 + 1.196050I$ | $-8.22119 + 6.06183I$ | $-7.41980 - 3.98537I$ |
| $u = 0.721919 - 0.835340I$<br>$a = -0.372316 + 0.313834I$<br>$b = 0.476440 - 1.196050I$ | $-8.22119 - 6.06183I$ | $-7.41980 + 3.98537I$ |
| $u = 0.495421 + 0.731154I$<br>$a = 1.122580 + 0.574754I$<br>$b = -0.732884 - 0.119482I$ | $-1.27974 - 2.37099I$ | $0.31894 + 3.15329I$ |
| $u = 0.495421 - 0.731154I$<br>$a = 1.122580 - 0.574754I$<br>$b = -0.732884 + 0.119482I$ | $-1.27974 + 2.37099I$ | $0.31894 - 3.15329I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.200040 + 0.713689I$<br>$a = 1.50067 - 1.01116I$<br>$b = -0.551950 + 0.938432I$ | $0.02332 - 6.64372I$ | $-0.26642 + 9.39853I$ |
| $u = 0.200040 - 0.713689I$<br>$a = 1.50067 + 1.01116I$<br>$b = -0.551950 - 0.938432I$ | $0.02332 + 6.64372I$ | $-0.26642 - 9.39853I$ |
| $u = 1.283430 + 0.258737I$<br>$a = -1.16481 - 0.94463I$<br>$b = 0.468567 - 0.922566I$ | $-2.99912 - 4.93329I$ | $-3.82940 + 6.57606I$ |
| $u = 1.283430 - 0.258737I$<br>$a = -1.16481 + 0.94463I$<br>$b = 0.468567 + 0.922566I$ | $-2.99912 + 4.93329I$ | $-3.82940 - 6.57606I$ |
| $u = -1.365140 + 0.043173I$<br>$a = -0.965795 + 0.425482I$<br>$b = 0.760139 - 0.637733I$ | $-2.59101 - 0.97059I$ | $-3.20816 + 2.30460I$ |
| $u = -1.365140 - 0.043173I$<br>$a = -0.965795 - 0.425482I$<br>$b = 0.760139 + 0.637733I$ | $-2.59101 + 0.97059I$ | $-3.20816 - 2.30460I$ |
| $u = 1.39159$<br>$a = 0.0610608$<br>$b = 0.727022$ | $-3.41993$ | $-0.649850$ |
| $u = -1.389770 + 0.195625I$<br>$a = 1.45955 - 0.21134I$<br>$b = -0.651228 - 1.025580I$ | $-4.98605 + 9.79445I$ | $-5.34481 - 8.93651I$ |
| $u = -1.389770 - 0.195625I$<br>$a = 1.45955 + 0.21134I$<br>$b = -0.651228 + 1.025580I$ | $-4.98605 - 9.79445I$ | $-5.34481 + 8.93651I$ |
| $u = -0.481446 + 0.181091I$<br>$a = 1.21465 - 1.46620I$<br>$b = -0.528136 - 1.141240I$ | $-3.37780 + 7.99798I$ | $0.71148 - 7.40743I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.481446-0.181091I$<br>$a=\ 1.21465+1.46620I$<br>$b=-0.528136+1.141240I$ | $-3.37780-7.99798I$ | $0.71148+7.40743I$ |
| $u=\ 1.51965+0.08089I$<br>$a=\ 0.71051+1.32043I$<br>$b=-0.495431+1.212500I$ | $-10.12230-9.08658I$ | $0$ |
| $u=\ 1.51965-0.08089I$<br>$a=\ 0.71051-1.32043I$<br>$b=-0.495431-1.212500I$ | $-10.12230+9.08658I$ | $0$ |
| $u=-0.100508+0.458939I$<br>$a=-2.27911+0.05270I$<br>$b=\ 0.543260+0.738488I$ | $1.32849+2.20779I$ | $4.23160-4.03649I$ |
| $u=-0.100508-0.458939I$<br>$a=-2.27911-0.05270I$<br>$b=\ 0.543260-0.738488I$ | $1.32849-2.20779I$ | $4.23160+4.03649I$ |
| $u=-1.52211+0.26355I$<br>$a=\ 0.493088-0.569107I$<br>$b=-0.872759+0.176459I$ | $-7.85990+6.04546I$ | $0$ |
| $u=-1.52211-0.26355I$<br>$a=\ 0.493088+0.569107I$<br>$b=-0.872759-0.176459I$ | $-7.85990-6.04546I$ | $0$ |
| $u=-1.55878+0.33189I$<br>$a=-1.50039+0.85083I$<br>$b=\ 0.543971+1.243490I$ | $-14.3234+16.5120I$ | $0$ |
| $u=-1.55878-0.33189I$<br>$a=-1.50039-0.85083I$<br>$b=\ 0.543971-1.243490I$ | $-14.3234-16.5120I$ | $0$ |
| $u=-1.63807+0.22494I$<br>$a=-0.012996-0.570463I$<br>$b=\ 0.408913-1.203980I$ | $-16.1932-2.1173I$ | $0$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-1.63807-0.22494I$<br>$a=-0.012996+0.570463I$<br>$b=\ \ 0.408913+1.203980I$ | $-16.1932+2.1173I$ | 0 |
| $u=-0.120066+0.311369I$<br>$a=\ \ 0.23634+1.50251I$<br>$b=\ \ 0.516750-0.437851I$ | $1.051550-0.797647I$ | $6.50655+3.66562I$ |
| $u=-0.120066-0.311369I$<br>$a=\ \ 0.23634-1.50251I$<br>$b=\ \ 0.516750+0.437851I$ | $1.051550+0.797647I$ | $6.50655-3.66562I$ |
| $u=-1.66607+0.03814I$<br>$a=\ \ 0.026783+0.627545I$<br>$b=-0.176178+0.879030I$ | $-11.63190-0.88202I$ | 0 |
| $u=-1.66607-0.03814I$<br>$a=\ \ 0.026783-0.627545I$<br>$b=-0.176178-0.879030I$ | $-11.63190+0.88202I$ | 0 |

**II.** $\boldsymbol{I_2^u = \langle -1763u^{28}a + 3881u^{28} + \cdots - 1262a + 2496,\ 29u^{28}a - 5u^{28} + \cdots + 5a + 39,\ u^{29} + 4u^{28} + \cdots + 2u + 1\rangle}$

**(i) Arc colorings**

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

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

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

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

$$a_4 = \begin{pmatrix} a \\ 1.52773au^{28} - 3.36308u^{28} + \cdots + 1.09359a - 2.16291 \end{pmatrix}$$

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

$$a_8 = \begin{pmatrix} 3.11308au^{28} - 0.363518u^{28} + \cdots + 1.91291a - 0.0706239 \\ -1.71274au^{28} + 2.52773u^{28} + \cdots - 1.18674a + 0.593588 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} -\frac{5}{2}u^{28} - \frac{11}{2}u^{27} + \cdots - \frac{11}{2}u - \frac{1}{2} \\ \frac{5}{4}u^{28} + \frac{13}{4}u^{27} + \cdots + \frac{1}{4}u + \frac{7}{4} \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 1.40035au^{28} + 2.16421u^{28} + \cdots + 0.726170a + 0.522964 \\ -1.71274au^{28} + 2.52773u^{28} + \cdots - 1.18674a + 0.593588 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 2.86092au^{28} - 2.45234u^{28} + \cdots + 2.62435a - 3.15165 \\ 3.70147au^{28} - 4.98960u^{28} + \cdots + 2.58622a - 3.71490 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} -3.90945au^{28} + 1.96274u^{28} + \cdots - 4.28813a + 2.43674 \\ -6.43718au^{28} + 5.32582u^{28} + \cdots - 4.88172a + 3.59965 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} \frac{9}{2}u^{28} + \frac{25}{2}u^{27} + \cdots + \frac{1}{2}u + \frac{9}{2} \\ \frac{19}{4}u^{28} + \frac{51}{4}u^{27} + \cdots + \frac{11}{4}u + \frac{17}{4} \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 9u^{28} + \frac{49}{2}u^{27} + \cdots + 10u + \frac{3}{2}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $u^{58} + 34u^{57} + \cdots + 432u + 81$ |
| $c_2, c_4, c_6$ $c_8$ | $u^{58} - 2u^{57} + \cdots - 24u + 9$ |
| $c_3$ | $(u^{29} - 2u^{28} + \cdots - 15u + 9)^2$ |
| $c_5, c_{11}$ | $(u^{29} - u^{28} + \cdots - 4u + 8)^2$ |
| $c_9, c_{10}, c_{12}$ | $(u^{29} - 4u^{28} + \cdots + 2u - 1)^2$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $y^{58} - 22y^{57} + \cdots - 31428y + 6561$ |
| $c_2, c_4, c_6$<br>$c_8$ | $y^{58} + 34y^{57} + \cdots + 432y + 81$ |
| $c_3$ | $(y^{29} - 24y^{28} + \cdots + 621y - 81)^2$ |
| $c_5, c_{11}$ | $(y^{29} + 21y^{28} + \cdots + 144y - 64)^2$ |
| $c_9, c_{10}, c_{12}$ | $(y^{29} - 30y^{28} + \cdots + 18y - 1)^2$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.574714 + 0.809142I$<br>$a = -0.496285 - 0.329278I$<br>$b = 0.383823 + 1.246440I$ | $-8.55101 - 2.70743I$ | $-7.83350 + 3.32702I$ |
| $u = 0.574714 + 0.809142I$<br>$a = -2.02764 - 0.04424I$<br>$b = 0.430351 - 1.199840I$ | $-8.55101 - 2.70743I$ | $-7.83350 + 3.32702I$ |
| $u = 0.574714 - 0.809142I$<br>$a = -0.496285 + 0.329278I$<br>$b = 0.383823 - 1.246440I$ | $-8.55101 + 2.70743I$ | $-7.83350 - 3.32702I$ |
| $u = 0.574714 - 0.809142I$<br>$a = -2.02764 + 0.04424I$<br>$b = 0.430351 + 1.199840I$ | $-8.55101 + 2.70743I$ | $-7.83350 - 3.32702I$ |
| $u = 0.673518 + 0.754049I$<br>$a = -1.000040 - 0.560059I$<br>$b = 0.769255 - 0.056261I$ | $-4.91068 + 1.51334I$ | $-4.49380 - 0.41799I$ |
| $u = 0.673518 + 0.754049I$<br>$a = 0.406818 + 0.385726I$<br>$b = -0.411656 - 1.172770I$ | $-4.91068 + 1.51334I$ | $-4.49380 - 0.41799I$ |
| $u = 0.673518 - 0.754049I$<br>$a = -1.000040 + 0.560059I$<br>$b = 0.769255 + 0.056261I$ | $-4.91068 - 1.51334I$ | $-4.49380 + 0.41799I$ |
| $u = 0.673518 - 0.754049I$<br>$a = 0.406818 - 0.385726I$<br>$b = -0.411656 + 1.172770I$ | $-4.91068 - 1.51334I$ | $-4.49380 + 0.41799I$ |
| $u = 0.496046 + 0.855361I$<br>$a = -1.099850 - 0.481039I$<br>$b = 0.852937 + 0.125205I$ | $-4.33597 - 6.94187I$ | $-3.09973 + 6.05967I$ |
| $u = 0.496046 + 0.855361I$<br>$a = 1.84336 - 0.14503I$<br>$b = -0.491051 + 1.177580I$ | $-4.33597 - 6.94187I$ | $-3.09973 + 6.05967I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.496046 - 0.855361I$<br>$a = -1.099850 + 0.481039I$<br>$b = 0.852937 - 0.125205I$ | $-4.33597 + 6.94187I$ | $-3.09973 - 6.05967I$ |
| $u = 0.496046 - 0.855361I$<br>$a = 1.84336 + 0.14503I$<br>$b = -0.491051 - 1.177580I$ | $-4.33597 + 6.94187I$ | $-3.09973 - 6.05967I$ |
| $u = 1.09947$<br>$a = -3.27542 + 2.45605I$<br>$b = 0.138638 + 1.028430I$ | $-5.36254$ | $1.86910$ |
| $u = 1.09947$<br>$a = -3.27542 - 2.45605I$<br>$b = 0.138638 - 1.028430I$ | $-5.36254$ | $1.86910$ |
| $u = 1.109450 + 0.283231I$<br>$a = 1.260760 + 0.513284I$<br>$b = -0.347220 + 0.737093I$ | $-1.85262 - 1.10103I$ | $-2.03106 - 0.28755I$ |
| $u = 1.109450 + 0.283231I$<br>$a = 0.187734 - 0.187443I$<br>$b = 0.397780 + 0.487721I$ | $-1.85262 - 1.10103I$ | $-2.03106 - 0.28755I$ |
| $u = 1.109450 - 0.283231I$<br>$a = 1.260760 - 0.513284I$<br>$b = -0.347220 - 0.737093I$ | $-1.85262 + 1.10103I$ | $-2.03106 + 0.28755I$ |
| $u = 1.109450 - 0.283231I$<br>$a = 0.187734 + 0.187443I$<br>$b = 0.397780 - 0.487721I$ | $-1.85262 + 1.10103I$ | $-2.03106 + 0.28755I$ |
| $u = -1.377160 + 0.122752I$<br>$a = 0.775794 - 0.486569I$<br>$b = -0.813747 + 0.500062I$ | $-3.43590 + 4.37313I$ | $-3.64888 - 4.01970I$ |
| $u = -1.377160 + 0.122752I$<br>$a = -1.396230 - 0.037221I$<br>$b = 0.666978 + 0.923318I$ | $-3.43590 + 4.37313I$ | $-3.64888 - 4.01970I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.377160 - 0.122752I$<br>$a = 0.775794 + 0.486569I$<br>$b = -0.813747 - 0.500062I$ | $-3.43590 - 4.37313I$ | $-3.64888 + 4.01970I$ |
| $u = -1.377160 - 0.122752I$<br>$a = -1.396230 + 0.037221I$<br>$b = 0.666978 - 0.923318I$ | $-3.43590 - 4.37313I$ | $-3.64888 + 4.01970I$ |
| $u = 0.093803 + 0.571484I$<br>$a = 1.77937 + 0.48269I$<br>$b = -0.596648 - 0.524729I$ | $1.17976 - 2.10537I$ | $3.42367 + 3.98592I$ |
| $u = 0.093803 + 0.571484I$<br>$a = -1.13444 + 1.49748I$<br>$b = 0.521180 - 0.791272I$ | $1.17976 - 2.10537I$ | $3.42367 + 3.98592I$ |
| $u = 0.093803 - 0.571484I$<br>$a = 1.77937 - 0.48269I$<br>$b = -0.596648 + 0.524729I$ | $1.17976 + 2.10537I$ | $3.42367 - 3.98592I$ |
| $u = 0.093803 - 0.571484I$<br>$a = -1.13444 - 1.49748I$<br>$b = 0.521180 + 0.791272I$ | $1.17976 + 2.10537I$ | $3.42367 - 3.98592I$ |
| $u = 1.46649 + 0.06834I$<br>$a = -0.79189 - 1.39162I$<br>$b = 0.454670 - 1.185180I$ | $-6.77922 - 4.29283I$ | $-4.53955 + 3.19264I$ |
| $u = 1.46649 + 0.06834I$<br>$a = -0.0365899 + 0.0197419I$<br>$b = -0.824448 - 0.084249I$ | $-6.77922 - 4.29283I$ | $-4.53955 + 3.19264I$ |
| $u = 1.46649 - 0.06834I$<br>$a = -0.79189 + 1.39162I$<br>$b = 0.454670 + 1.185180I$ | $-6.77922 + 4.29283I$ | $-4.53955 - 3.19264I$ |
| $u = 1.46649 - 0.06834I$<br>$a = -0.0365899 - 0.0197419I$<br>$b = -0.824448 + 0.084249I$ | $-6.77922 + 4.29283I$ | $-4.53955 - 3.19264I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.46813$<br>$a = 0.70362 + 1.51889I$<br>$b = -0.412156 + 1.228670I$ | $-10.7199$ | $-8.58670$ |
| $u = 1.46813$<br>$a = 0.70362 - 1.51889I$<br>$b = -0.412156 - 1.228670I$ | $-10.7199$ | $-8.58670$ |
| $u = -1.46854 + 0.05369I$<br>$a = -0.000804 + 0.602797I$<br>$b = -0.077278 + 1.297810I$ | $-9.63904 + 2.02688I$ | $-7.64196 - 3.46616I$ |
| $u = -1.46854 + 0.05369I$<br>$a = 1.66820 + 0.63206I$<br>$b = -0.489594 - 0.791303I$ | $-9.63904 + 2.02688I$ | $-7.64196 - 3.46616I$ |
| $u = -1.46854 - 0.05369I$<br>$a = -0.000804 - 0.602797I$<br>$b = -0.077278 - 1.297810I$ | $-9.63904 - 2.02688I$ | $-7.64196 + 3.46616I$ |
| $u = -1.46854 - 0.05369I$<br>$a = 1.66820 - 0.63206I$<br>$b = -0.489594 + 0.791303I$ | $-9.63904 - 2.02688I$ | $-7.64196 + 3.46616I$ |
| $u = 0.332600 + 0.298296I$<br>$a = 1.17191 + 1.35445I$<br>$b = -0.078563 - 1.142090I$ | $-3.67943 - 0.93878I$ | $-2.80996 + 7.32576I$ |
| $u = 0.332600 + 0.298296I$<br>$a = 2.88434 - 4.02305I$<br>$b = -0.196086 + 0.856959I$ | $-3.67943 - 0.93878I$ | $-2.80996 + 7.32576I$ |
| $u = 0.332600 - 0.298296I$<br>$a = 1.17191 - 1.35445I$<br>$b = -0.078563 + 1.142090I$ | $-3.67943 + 0.93878I$ | $-2.80996 - 7.32576I$ |
| $u = 0.332600 - 0.298296I$<br>$a = 2.88434 + 4.02305I$<br>$b = -0.196086 - 0.856959I$ | $-3.67943 + 0.93878I$ | $-2.80996 - 7.32576I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-1.54068+0.30648I$<br>$a=-0.461477+0.542815I$<br>$b=\ \ 0.930068-0.139535I$ | $-10.9685+11.1989I$ | $-5.19156-6.17598I$ |
| $u=-1.54068+0.30648I$<br>$a=\ \ 1.56938-0.78799I$<br>$b=-0.541040-1.210840I$ | $-10.9685+11.1989I$ | $-5.19156-6.17598I$ |
| $u=-1.54068-0.30648I$<br>$a=-0.461477-0.542815I$<br>$b=\ \ 0.930068+0.139535I$ | $-10.9685-11.1989I$ | $-5.19156+6.17598I$ |
| $u=-1.54068-0.30648I$<br>$a=\ \ 1.56938+0.78799I$<br>$b=-0.541040+1.210840I$ | $-10.9685-11.1989I$ | $-5.19156+6.17598I$ |
| $u=-1.56175+0.26987I$<br>$a=\ \ 0.005904-0.572450I$<br>$b=\ \ 0.376897-1.308090I$ | $-15.5682+6.6680I$ | $-9.30046-3.89200I$ |
| $u=-1.56175+0.26987I$<br>$a=-1.71421+0.84034I$<br>$b=\ \ 0.496073+1.194220I$ | $-15.5682+6.6680I$ | $-9.30046-3.89200I$ |
| $u=-1.56175-0.26987I$<br>$a=\ \ 0.005904+0.572450I$<br>$b=\ \ 0.376897+1.308090I$ | $-15.5682-6.6680I$ | $-9.30046+3.89200I$ |
| $u=-1.56175-0.26987I$<br>$a=-1.71421-0.84034I$<br>$b=\ \ 0.496073-1.194220I$ | $-15.5682-6.6680I$ | $-9.30046+3.89200I$ |
| $u=-0.356186+0.206024I$<br>$a=-0.329572-0.575621I$<br>$b=-0.730042+0.234742I$ | $-0.75685+3.25312I$ | $3.53153-3.58405I$ |
| $u=-0.356186+0.206024I$<br>$a=-1.75145+1.68560I$<br>$b=\ \ 0.474813+1.053290I$ | $-0.75685+3.25312I$ | $3.53153-3.58405I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.356186 - 0.206024I$<br>$a = -0.329572 + 0.575621I$<br>$b = -0.730042 - 0.234742I$ | $-0.75685 - 3.25312I$ | $3.53153 + 3.58405I$ |
| $u = -0.356186 - 0.206024I$<br>$a = -1.75145 - 1.68560I$<br>$b = \quad 0.474813 - 1.053290I$ | $-0.75685 - 3.25312I$ | $3.53153 + 3.58405I$ |
| $u = -1.57403 + 0.21687I$<br>$a = -0.455066 + 0.636664I$<br>$b = \quad 0.779101 - 0.101681I$ | $-12.38060 + 1.97634I$ | $-6.56391 + 0.I$ |
| $u = -1.57403 + 0.21687I$<br>$a = \quad 0.002336 + 0.579304I$<br>$b = -0.340208 + 1.254970I$ | $-12.38060 + 1.97634I$ | $-6.56391 + 0.I$ |
| $u = -1.57403 - 0.21687I$<br>$a = -0.455066 - 0.636664I$<br>$b = \quad 0.779101 + 0.101681I$ | $-12.38060 - 1.97634I$ | $-6.56391 + 0.I$ |
| $u = -1.57403 - 0.21687I$<br>$a = \quad 0.002336 - 0.579304I$<br>$b = -0.340208 - 1.254970I$ | $-12.38060 - 1.97634I$ | $-6.56391 + 0.I$ |
| $u = -0.304151$<br>$a = \quad 0.71142 + 2.97196I$<br>$b = -0.322825 + 1.145710I$ | $-4.79354$ | $-1.88400$ |
| $u = -0.304151$<br>$a = \quad 0.71142 - 2.97196I$<br>$b = -0.322825 - 1.145710I$ | $-4.79354$ | $-1.88400$ |

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

**(i) Arc colorings**

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

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

$$a_{10} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

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

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

$$a_{11} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} 0 \\ -2a^3 + 3a^2 + a - 1 \end{pmatrix}$$

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

$$a_3 = \begin{pmatrix} -2a^3 + a^2 + a - 1 \\ -2a^3 + a^2 - 1 \end{pmatrix}$$

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

$$a_6 = \begin{pmatrix} 0 \\ -2a^3 + 3a^2 + a - 1 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 16a^3 - 9a^2 - 10a + 3$

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

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

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

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

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

| Solutions to $I_3^u$ | $\sqrt{-1}(\text{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.00000$<br>$a = 0.927958 + 0.413327I$<br>$b = -0.547424 + 1.120870I$ | $-4.26996 - 7.64338I$ | $-7.31637 + 4.91712I$ |
| $u = 1.00000$<br>$a = 0.927958 - 0.413327I$<br>$b = -0.547424 - 1.120870I$ | $-4.26996 + 7.64338I$ | $-7.31637 - 4.91712I$ |
| $u = 1.00000$<br>$a = -0.677958 + 0.157780I$<br>$b = 0.547424 - 0.585652I$ | $-0.66484 - 1.39709I$ | $1.69137 + 3.76574I$ |
| $u = 1.00000$<br>$a = -0.677958 - 0.157780I$<br>$b = 0.547424 + 0.585652I$ | $-0.66484 + 1.39709I$ | $1.69137 - 3.76574I$ |

**IV.**

$\boldsymbol{I_4^u = \langle a^5 - a^4 - 3a^3 + 4a^2 + b + 4a - 2,\ a^6 - 2a^5 - a^4 + 5a^3 - 3a + 1,\ u - 1\rangle}$

**(i) Arc colorings**

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

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

$$a_{10} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

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

$$a_4 = \begin{pmatrix} a \\ -a^5 + a^4 + 3a^3 - 4a^2 - 4a + 2 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -a^5 + 2a^4 + a^3 - 4a^2 - a + 2 \\ 2a^5 - 3a^4 - 3a^3 + 7a^2 + 4a - 3 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} 0 \\ -3a^5 + 4a^4 + 6a^3 - 12a^2 - 7a + 5 \end{pmatrix}$$

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

$$a_3 = \begin{pmatrix} -4a^5 + 6a^4 + 7a^3 - 16a^2 - 8a + 7 \\ -4a^5 + 6a^4 + 7a^3 - 16a^2 - 9a + 7 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} -4a^5 + 6a^4 + 7a^3 - 16a^2 - 8a + 7 \\ -6a^5 + 9a^4 + 11a^3 - 25a^2 - 13a + 12 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 0 \\ -3a^5 + 4a^4 + 6a^3 - 12a^2 - 7a + 5 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 10a^5 - 13a^4 - 20a^3 + 39a^2 + 23a - 22$

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

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

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

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

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

| Solutions to $I_4^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.00000$<br>$a = -1.060970 + 0.237841I$<br>$b = 0.498832 + 1.001300I$ | $-1.91067 + 2.82812I$ | $-2.82789 - 2.41717I$ |
| $u = 1.00000$<br>$a = -1.060970 - 0.237841I$<br>$b = 0.498832 - 1.001300I$ | $-1.91067 - 2.82812I$ | $-2.82789 + 2.41717I$ |
| $u = 1.00000$<br>$a = 0.521167 + 0.055259I$<br>$b = -0.713912 - 0.305839I$ | $-1.91067 - 2.82812I$ | $-2.82789 + 2.41717I$ |
| $u = 1.00000$<br>$a = 0.521167 - 0.055259I$<br>$b = -0.713912 + 0.305839I$ | $-1.91067 + 2.82812I$ | $-2.82789 - 2.41717I$ |
| $u = 1.00000$<br>$a = 1.53980 + 0.84179I$<br>$b = -0.284920 + 1.115140I$ | $-6.04826$ | $-11.34423 + 0.I$ |
| $u = 1.00000$<br>$a = 1.53980 - 0.84179I$<br>$b = -0.284920 - 1.115140I$ | $-6.04826$ | $-11.34423 + 0.I$ |

### V. $\boldsymbol{I_5^u = \langle au + b + u + 1,\ a^2 + 2au + 4a + 4u + 7,\ u^2 + u - 1\rangle}$

**(i) Arc colorings**

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

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

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

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

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

$$a_{11} = \begin{pmatrix} u \\ u \end{pmatrix}$$

$$a_8 = \begin{pmatrix} au + a + 3u + 5 \\ -1 \end{pmatrix}$$

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

$$a_7 = \begin{pmatrix} au + a + 3u + 4 \\ -1 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} a \\ -au - u - 1 \end{pmatrix}$$

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

$$a_6 = \begin{pmatrix} au - a - 1 \\ 2au - a + u \end{pmatrix}$$

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

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

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

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

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

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

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

| Solutions to $I_5^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.618034$<br>$a = -2.61803 + 1.61803I$<br>$b = -1.000000I$ | $-4.27683$ | $-12.0000$ |
| $u = 0.618034$<br>$a = -2.61803 - 1.61803I$<br>$b = 1.000000I$ | $-4.27683$ | $-12.0000$ |
| $u = -1.61803$<br>$a = -0.381966 + 0.618034I$<br>$b = 1.000000I$ | $-12.1725$ | $-12.0000$ |
| $u = -1.61803$<br>$a = -0.381966 - 0.618034I$<br>$b = -1.000000I$ | $-12.1725$ | $-12.0000$ |

## VI. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $(u-1)^4(u^4-2u^3+3u^2-u+1)(u^6-3u^5+4u^4-2u^3+1)$<br>$\cdot(u^{35}+18u^{34}+\cdots-9u-1)(u^{58}+34u^{57}+\cdots+432u+81)$ |
| $c_2, c_4$ | $(u^2+1)^2(u^4+u^2+u+1)(u^6-u^5+2u^4-2u^3+2u^2-2u+1)$<br>$\cdot(u^{35}+9u^{33}+\cdots-u-1)(u^{58}-2u^{57}+\cdots-24u+9)$ |
| $c_3$ | $u^4(u^3-u^2+1)^2(u^4+3u^3+\cdots+3u+2)(u^{29}-2u^{28}+\cdots-15u+9)^2$<br>$\cdot(u^{35}+6u^{34}+\cdots+64u-64)$ |
| $c_5, c_{11}$ | $u^{10}(u^4+3u^2+1)(u^{29}-u^{28}+\cdots-4u+8)^2$<br>$\cdot(u^{35}+3u^{34}+\cdots-112u+64)$ |
| $c_6, c_8$ | $(u^2+1)^2(u^4+u^2-u+1)(u^6+u^5+2u^4+2u^3+2u^2+2u+1)$<br>$\cdot(u^{35}+9u^{33}+\cdots-u-1)(u^{58}-2u^{57}+\cdots-24u+9)$ |
| $c_9, c_{10}$ | $((u-1)^{10})(u^2+u-1)^2(u^{29}-4u^{28}+\cdots+2u-1)^2$<br>$\cdot(u^{35}-5u^{34}+\cdots-13u+4)$ |
| $c_{12}$ | $((u+1)^{10})(u^2-u-1)^2(u^{29}-4u^{28}+\cdots+2u-1)^2$<br>$\cdot(u^{35}-5u^{34}+\cdots-13u+4)$ |

## VII. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_7$ | $(y-1)^4(y^4+2y^3+7y^2+5y+1)(y^6-y^5+4y^4-2y^3+8y^2+1)$ <br> $\cdot\,(y^{35}+6y^{34}+\cdots+3y-1)(y^{58}-22y^{57}+\cdots-31428y+6561)$ |
| $c_2, c_4, c_6$ <br> $c_8$ | $(y+1)^4(y^4+2y^3+3y^2+y+1)(y^6+3y^5+4y^4+2y^3+1)$ <br> $\cdot\,(y^{35}+18y^{34}+\cdots-9y-1)(y^{58}+34y^{57}+\cdots+432y+81)$ |
| $c_3$ | $y^4(y^3-y^2+2y-1)^2(y^4-y^3+2y^2+7y+4)$ <br> $\cdot\,(y^{29}-24y^{28}+\cdots+621y-81)^2$ <br> $\cdot\,(y^{35}-24y^{34}+\cdots-57344y-4096)$ |
| $c_5, c_{11}$ | $y^{10}(y^2+3y+1)^2(y^{29}+21y^{28}+\cdots+144y-64)^2$ <br> $\cdot\,(y^{35}+27y^{34}+\cdots-7936y-4096)$ |
| $c_9, c_{10}, c_{12}$ | $((y-1)^{10})(y^2-3y+1)^2(y^{29}-30y^{28}+\cdots+18y-1)^2$ <br> $\cdot\,(y^{35}-37y^{34}+\cdots-175y-16)$ |