

Pensieve header: Implementing  $\rho_1$  (old version, before the first conversion).

tex

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\def\nbpdfInput#1{\vskip 1mm\par\noindent\includegraphics{#1}}
\def\nbpdfEcho#1{\vskip 1mm\par\noindent\includegraphics{#1}}
\def\nbpdfPrint#1{\vskip 1mm\par\noindent\includegraphics{#1}}
\def\nbpdfText#1{\vskip 1mm\par\noindent\includegraphics{#1}}
\def\nbpdfMessage#1{\vskip 1mm\par\noindent\includegraphics{#1}}
\def\nbpdfOutput#1{\vskip 1mm\par\noindent\includegraphics{#1}}
\def\nbpdfSubsection#1{\vskip 1mm\par\noindent\includegraphics{#1}}
\def\nbpdfgraphInput#1{\vskip 1mm\par\noindent\includegraphics{#1}}
\def\nbpdfgraphOutput#1{\vskip 1mm\par\noindent\includegraphics[width=1.5in]{#1}}
```

```
In[ ]:= SetDirectory["C:\\drorbn\\AcademicPensieve\\Talks\\Waco-2203"];
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```
In[ ]:= Once[<< KnotTheory` ; << RVK.m];
```

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Loading KnotTheory` version of February 2, 2020, 10:53:45.2097.  
Read more at <http://katlas.org/wiki/KnotTheory>.

tex

```
\def\sep{\rule{\linewidth}{0.5pt}}
\sep
```

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```
 $\rho[K_] := \text{Module}[\{Cs, r, n, B, A, c, s, i, j, \Delta, G, g, \rho1\},$ 
  {Cs, r} = List@@RVK[K]; n = Length[Cs]; B = Table[0, 2 n, 2 n + 1];
  Do[{s, i, j} = c;
    B[[{i, j}, {i, j, i + 1, j + 1}]] =  $\begin{pmatrix} 1 & 0 & -1 & 0 \\ 0 & 1 & T^s & -1 - T^s \end{pmatrix}$ , {c, Cs}];
  A = B[[All, 2 ;;]];
   $\Delta = T^{(\text{Total}[r] - \text{Total}[\text{First}@\text{Cs}]) / 2} \text{Det}[A]$ ;
  G = Prepend[Table[0, 2 n]] [Inverse[A]];  $g_{\alpha, \beta} := G[[\alpha, \beta]]$ ;
   $\rho1 = \Delta^2 \text{Sum}[\{s, i, j} = c;$ 
     $s \left( (1 - T^s) g_{ij} (g_{ij} - g_{jj}) + 2 g_{ii} g_{ij} - g_{ij} g_{ji} - g_{ii} g_{jj} - g_{ij} + g_{jj} - 1 / 2 \right)$ , {c, Cs}];
   $\rho1 += \Delta^2 \text{Sum}[r[[k]] (g_{kk} - 1 / 2)$ , {k, 2 n}];
  Factor@{ $\Delta, \rho1$ }];
```

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```
In[ ]:= Do[Echo[K  $\rightarrow$   $\rho[K]$ ], {K, AllKnots[{3, 6}]}]
```

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KnotTheory: Loading precomputed data in PD4Knots`.

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$$\gg \text{Knot}[3, 1] \rightarrow \left\{ \frac{1 - T + T^2}{T}, \frac{(-1 + T)^2 (1 + T^2)}{T^2} \right\}$$

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$$\gg \text{Knot}[4, 1] \rightarrow \left\{ -\frac{1 - 3T + T^2}{T}, 0 \right\}$$

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$$\gg \text{Knot}[5, 1] \rightarrow \left\{ \frac{1 - T + T^2 - T^3 + T^4}{T^2}, \frac{(-1 + T)^2 (1 + T^2) (2 + T^2 + 2T^4)}{T^4} \right\}$$

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$$\gg \text{Knot}[5, 2] \rightarrow \left\{ \frac{2 - 3T + 2T^2}{T}, \frac{(-1 + T)^2 (5 - 4T + 5T^2)}{T^2} \right\}$$

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$$\gg \text{Knot}[6, 1] \rightarrow \left\{ -\frac{(-2 + T)(-1 + 2T)}{T}, \frac{(-1 + T)^2 (1 - 4T + T^2)}{T^2} \right\}$$

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$$\gg \text{Knot}[6, 2] \rightarrow \left\{ -\frac{1 - 3T + 3T^2 - 3T^3 + T^4}{T^2}, \frac{(-1 + T)^2 (1 - 4T + 4T^2 - 4T^3 + 4T^4 - 4T^5 + T^6)}{T^4} \right\}$$

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$$\gg \text{Knot}[6, 3] \rightarrow \left\{ \frac{1 - 3T + 5T^2 - 3T^3 + T^4}{T^2}, 0 \right\}$$

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\sep

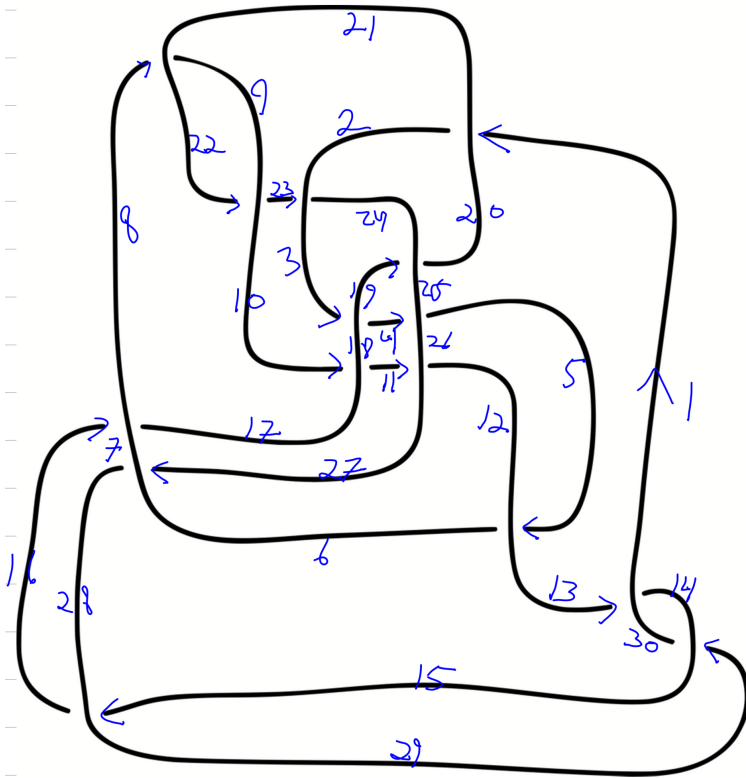
\[ \resizebox{\linewidth}{!}{\input{GST48-Marked.pdf\_t}} \]

pdf

In[ ]:= **Timing**@ $\rho$  [ **EPD** [  $X_{14,1}$ ,  $\bar{X}_{2,29}$ ,  $X_{3,40}$ ,  $X_{43,4}$ ,  $\bar{X}_{26,5}$ ,  $X_{6,95}$ ,  $X_{96,7}$ ,  $X_{13,8}$ ,  $\bar{X}_{9,28}$ ,  $X_{10,41}$ ,  $X_{42,11}$ ,  $\bar{X}_{27,12}$ ,  $X_{30,15}$ ,  $\bar{X}_{16,61}$ ,  $\bar{X}_{17,72}$ ,  $\bar{X}_{18,83}$ ,  $X_{19,34}$ ,  $\bar{X}_{89,20}$ ,  $\bar{X}_{21,92}$ ,  $\bar{X}_{79,22}$ ,  $\bar{X}_{68,23}$ ,  $\bar{X}_{57,24}$ ,  $\bar{X}_{25,56}$ ,  $X_{62,31}$ ,  $X_{73,32}$ ,  $X_{84,33}$ ,  $\bar{X}_{50,35}$ ,  $X_{36,81}$ ,  $X_{37,70}$ ,  $X_{38,59}$ ,  $\bar{X}_{39,54}$ ,  $X_{44,55}$ ,  $X_{58,45}$ ,  $X_{69,46}$ ,  $X_{80,47}$ ,  $X_{48,91}$ ,  $X_{90,49}$ ,  $X_{51,82}$ ,  $X_{52,71}$ ,  $X_{53,60}$ ,  $\bar{X}_{63,74}$ ,  $\bar{X}_{64,85}$ ,  $\bar{X}_{76,65}$ ,  $\bar{X}_{87,66}$ ,  $\bar{X}_{67,94}$ ,  $\bar{X}_{75,86}$ ,  $\bar{X}_{88,77}$ ,  $\bar{X}_{78,93}$  ] ]

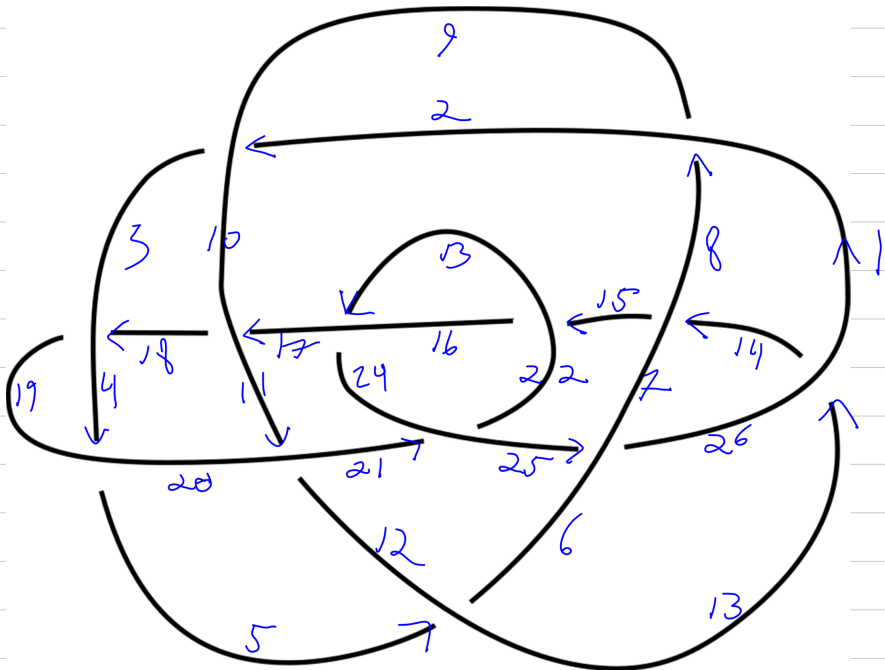
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$$\text{Out[ ]}:= \left\{ 72.5469, \left\{ -\frac{(-1 + 2T - T^2 - T^3 + 2T^4 - T^5 + T^8)(-1 + T^3 - 2T^4 + T^5 + T^6 - 2T^7 + T^8)}{T^8}, \frac{1}{T^{16}} (-1 + T)^2 (5 - 18T + 33T^2 - 32T^3 + 2T^4 + 42T^5 - 62T^6 - 8T^7 + 166T^8 - 242T^9 + 108T^{10} + 132T^{11} - 226T^{12} + 148T^{13} - 11T^{14} - 36T^{15} - 11T^{16} + 148T^{17} - 226T^{18} + 132T^{19} + 108T^{20} - 242T^{21} + 166T^{22} - 8T^{23} - 62T^{24} + 42T^{25} + 2T^{26} - 32T^{27} + 33T^{28} - 18T^{29} + 5T^{30}) \right\} \right\}$$



```
In[ ]:= Timing@ρ[EPD[X20,1, X̄18,3, X25,4, X̄12,5, X21,8,  
X̄17,10, X26,11, X̄30,13, X̄28,15, X̄7,16, X24,19, X9,22, X2,23, X6,27, X̄14,29]]
```

```
Out[ ]:= {0.84375, {1, 0}}
```



```
In[*]:= Timing@ρ [EPD [X̄9,2, X̄19,4, X12,5, X̄1,8, X̄20,11, X26,13, X7,14, X22,15, X̄10,17, X̄3,18, X24,21, X16,23, X̄6,25]]
```

```
Out[*]:= {0.484375, {1, 0}}
```