In[•]:=
```
Once[
 SetDirectory["C:\\drorbn\\AcademicPensieve\\Projects\\SL2Invariant"];
 << SL2Invariant`
]
```

```
Loading KnotTheory` version of January 20, 2015, 10:42:19.1122.
Read more at http://katlas.org/wiki/KnotTheory.

This is Profile.m of http://www.drorbn.net/AcademicPensieve/Projects/Profile/.

This version: June 2018. Original version: July 1994.
```

In[•]:=
```
AllKnots[{3, 7}]
```

Out[•]=
```
{Knot[3, 1], Knot[4, 1], Knot[5, 1], Knot[5, 2], Knot[6, 1], Knot[6, 2], Knot[6, 3],
 Knot[7, 1], Knot[7, 2], Knot[7, 3], Knot[7, 4], Knot[7, 5], Knot[7, 6], Knot[7, 7]}
```

In[•]:=
```
$k = 1; Zs = Timing[Z[#]] & /@ AllKnots[{3, 7}]
```

KnotTheory: Loading precomputed data in PD4Knots`.

Out[•]=

$$\{\{7.10938,\ \mathbb{E}_{\{\}\to\{0\}}\left[0,0,\frac{T}{1-T+T^2}+\frac{T\left(-2+3T-2T^2+T^3+2a\left(-1+T-T^3+T^4\right)-2xy-2T^3xy\right)\epsilon}{\left(1-T+T^2\right)^3}+O[\epsilon]^2\right]\},$$

$$\{3.98438,\ \mathbb{E}_{\{\}\to\{0\}}\left[0,0,-\frac{T}{1-3T+T^2}-\frac{T\left(1+T\right)\left(-1+2a\left(-1+T\right)+T-2xy\right)\epsilon}{\left(1-3T+T^2\right)^2}+O[\epsilon]^2\right]\},$$

$$\{21.0938,\ \mathbb{E}_{\{\}\to\{0\}}\left[0,0,\frac{T^2}{1-T+T^2-T^3+T^4}+\left(T^2\left(8T^3-6T^4+a\left(-4+6T-6T^2+4T^3-4T^5+6T^6-6T^7+4T^8\right)+T^7\left(1-4xy\right)+T^5\left(4-4xy\right)+2T^6\left(-1+xy\right)-4\left(1+xy\right)-4T^2\left(2+xy\right)+T\left(7+2xy\right)\right)\epsilon\right)/\left(1-T+T^2-T^3+T^4\right)^3+O[\epsilon]^2\right]\},$$

$$\{85.4063,\ \mathbb{E}_{\{\}\to\{0\}}\left[0,0,\frac{T}{2-3T+2T^2}+\left(T\left(-9-T^4+4a\left(-2+3T-3T^3+2T^4\right)-8xy+T^3\left(8-8xy\right)+4T\left(5+xy\right)+2T^2\left(-9+2xy\right)\right)\epsilon\right)/\left(2-3T+2T^2\right)^3+O[\epsilon]^2\right]\},$$

$$\{103.234,\ \mathbb{E}_{\{\}\to\{0\}}\left[0,0,-\frac{T}{2-5T+2T^2}+\left(T\left(5-3T^4-4a\left(-2+5T-5T^3+2T^4\right)+8xy-4T\left(4+3xy\right)-2T^2\left(-5+6xy\right)+T^3\left(4+8xy\right)\right)\epsilon\right)/\left(2-5T+2T^2\right)^3+O[\epsilon]^2\right]\},$$

$$\{74.4531,\ \mathbb{E}_{\{\}\to\{0\}}\left[0,0,-\frac{T^2}{1-3T+3T^2-3T^3+T^4}-\left(T^2\left(-3+T^8+2a\left(-2+9T-15T^2+12T^3-12T^5+15T^6-9T^7+2T^8\right)-4xy+T^5\left(4-16xy\right)+8T^4\left(-2+xy\right)+4T^3\left(7+2xy\right)-T^7\left(3+4xy\right)-4T^2\left(7+4xy\right)+2T^6\left(1+7xy\right)+T\left(15+14xy\right)\right)\epsilon\right)/\left(1-3T+3T^2-3T^3+T^4\right)^3+O[\epsilon]^2\right]\},$$

$$\{23.1719,\ \mathbb{E}_{\{\}\to\{0\}}\left[0,0,\frac{T^2}{1-3T+5T^2-3T^3+T^4}+\frac{T^2\left(2-T-T^2+2T^3\right)\left(-1+2a\left(-1+T\right)+T-2xy\right)\epsilon}{\left(1-3T+5T^2-3T^3+T^4\right)^2}+O[\epsilon]^2\right]\},$$

$$\{50.625,\ \mathbb{E}_{\{\}\to\{0\}}\left[0,0,\frac{T^3}{1-T+T^2-T^3+T^4-T^5+T^6}+\frac{1}{\left(1-T+T^2-T^3+T^4-T^5+T^6\right)^3}T^3\left(15T^5-12T^6+2a\left(-3+5T-6T^2+6T^3-5T^4+3T^5-3T^7+5T^8-6T^9+6T^{10}-5T^{11}+3T^{12}\right)+T^9\left(4-8xy\right)+T^{11}\left(1-6xy\right)+T^7\left(9-6xy\right)-6\left(1+xy\right)+4T^3\left(4+xy\right)-2T^4\left(8+3xy\right)+T^8\left(-6+4xy\right)+T^{10}\left(-2+4xy\right)-2T^2\left(7+4xy\right)+T\left(11+4xy\right)\right)\epsilon+O[\epsilon]^2\right]\},$$

$$\{195.469,\ \mathbb{E}_{\{\}\to\{0\}}\left[0,0,\frac{T}{3-5T+3T^2}+\left(T\left(-23-5T^4+6a\left(-3+5T-5T^3+3T^4\right)-18xy+\right.\right.\right.$$

$$T^3\left(29-18\,x\,y\right)+12\,T^2\,\left(-5+x\,y\right)+T\left(59+12\,x\,y\right)\Big)\,\epsilon\Big)\Big/\left(3-5\,T+3\,T^2\right)^3+O[\epsilon]^2\Big]\Big\},$$

$$\Big\{139.125,\ \mathbb{E}_{\{\}\to\{0\}}\Big[0,\,0,\,\frac{T^2}{2-3\,T+3\,T^2-3\,T^3+2\,T^4}+$$
$$\Big(T^2\left(1+17\,T^8+2\,a\left(-8+18\,T-21\,T^2+15\,T^3-15\,T^5+21\,T^6-18\,T^7+8\,T^8\right)-16\,x\,y+\right.$$
$$T^2\left(20-22\,x\,y\right)+8\,T^4\,\left(7+x\,y\right)-4\,T^7\left(11+4\,x\,y\right)+4\,T\left(-2+5\,x\,y\right)+T^3\left(-37+8\,x\,y\right)+$$
$$\left.T^6\left(62+20\,x\,y\right)-T^5\left(67+22\,x\,y\right)\right)\,\epsilon\Big)\Big/\left(2-3\,T+3\,T^2-3\,T^3+2\,T^4\right)^3+O[\epsilon]^2\Big]\Big\},$$

$$\Big\{87.4531,\ \mathbb{E}_{\{\}\to\{0\}}\Big[0,\,0,\,\frac{T}{4-7\,T+4\,T^2}+\Big(4\,T\left(2+10\,T^4+2\,a\left(-4+7\,T-7\,T^3+4\,T^4\right)-8\,x\,y+\right.$$
$$\left.T\left(-13+6\,x\,y\right)+T^2\left(28+6\,x\,y\right)-T^3\left(27+8\,x\,y\right)\right)\,\epsilon\Big)\Big/\left(4-7\,T+4\,T^2\right)^3+O[\epsilon]^2\Big]\Big\},$$

$$\Big\{201.922,\ \mathbb{E}_{\{\}\to\{0\}}\Big[0,\,0,\,\frac{T^2}{2-4\,T+5\,T^2-4\,T^3+2\,T^4}+$$
$$\Big(T^2\left(-17-T^8+8\,a\left(-2+6\,T-9\,T^2+7\,T^3-7\,T^5+9\,T^6-6\,T^7+2\,T^8\right)-16\,x\,y+T^5\left(74-40\,x\,y\right)+\right.$$
$$2\,T^4\left(-57+8\,x\,y\right)-2\,T^7\left(-5+8\,x\,y\right)+2\,T^3\left(65+8\,x\,y\right)-2\,T^2\left(53+20\,x\,y\right)+$$
$$\left.T^6\left(-34+32\,x\,y\right)+T\left(58+32\,x\,y\right)\right)\,\epsilon\Big)\Big/\left(2-4\,T+5\,T^2-4\,T^3+2\,T^4\right)^3+O[\epsilon]^2\Big]\Big\},$$

$$\Big\{335.141,\ \mathbb{E}_{\{\}\to\{0\}}\Big[0,\,0,\,-\frac{T^2}{1-5\,T+7\,T^2-5\,T^3+T^4}-$$
$$\Big(T^2\left(-3+T^8+a\left(-4+30\,T-78\,T^2+80\,T^3-80\,T^5+78\,T^6-30\,T^7+4\,T^8\right)-4\,x\,y+\right.$$
$$T^5\left(26-52\,x\,y\right)-T^7\left(5+4\,x\,y\right)+2\,T^3\left(53+14\,x\,y\right)+T^6\left(3+26\,x\,y\right)+T\left(25+26\,x\,y\right)+$$
$$\left.T^4\left(-78+28\,x\,y\right)-T^2\left(75+52\,x\,y\right)\right)\,\epsilon\Big)\Big/\left(1-5\,T+7\,T^2-5\,T^3+T^4\right)^3+O[\epsilon]^2\Big]\Big\},$$

$$\Big\{281.094,\ \mathbb{E}_{\{\}\to\{0\}}\Big[0,\,0,\,\frac{T^2}{1-5\,T+9\,T^2-5\,T^3+T^4}+$$
$$\Big(T^2\left(-2+2\,T^8+2\,a\left(-2+15\,T-43\,T^2+50\,T^3-50\,T^5+43\,T^6-15\,T^7+2\,T^8\right)-4\,x\,y-\right.$$
$$20\,T^2\left(2+3\,x\,y\right)-T^7\left(15+4\,x\,y\right)+4\,T^3\left(9+10\,x\,y\right)-4\,T^5\left(16+15\,x\,y\right)+T\left(15+26\,x\,y\right)+$$
$$\left.T^6\left(46+26\,x\,y\right)+T^4\left(22+40\,x\,y\right)\right)\,\epsilon\Big)\Big/\left(1-5\,T+9\,T^2-5\,T^3+T^4\right)^3+O[\epsilon]^2\Big]\Big\}\Big\}$$

In[•]:= **Zs[[All, 2, 3]] // Normal**

Out[•]=
$$\Big\{\frac{T}{1-T+T^2}+\frac{T\left(-2+3\,T-2\,T^2+T^3+2\,a\left(-1+T-T^3+T^4\right)-2\,x\,y-2\,T^3\,x\,y\right)\,\epsilon}{\left(1-T+T^2\right)^3},$$

$$-\frac{T}{1-3\,T+T^2}-\frac{T\left(1+T\right)\,\left(-1+2\,a\left(-1+T\right)+T-2\,x\,y\right)\,\epsilon}{\left(1-3\,T+T^2\right)^2},$$

$$\frac{T^2}{1-T+T^2-T^3+T^4}+\Big(T^2\left(8\,T^3-6\,T^4+a\left(-4+6\,T-6\,T^2+4\,T^3-4\,T^5+6\,T^6-6\,T^7+4\,T^8\right)+T^7\left(1-4\,x\,y\right)+\right.$$
$$\left.T^5\left(4-4\,x\,y\right)+2\,T^6\left(-1+x\,y\right)-4\left(1+x\,y\right)-4\,T^2\left(2+x\,y\right)+T\left(7+2\,x\,y\right)\right)\,\epsilon\Big)\Big/$$
$$\left(1-T+T^2-T^3+T^4\right)^3,\ \frac{T}{2-3\,T+2\,T^2}+\frac{1}{\left(2-3\,T+2\,T^2\right)^3}$$
$$T\left(-9-T^4+4\,a\left(-2+3\,T-3\,T^3+2\,T^4\right)-8\,x\,y+T^3\left(8-8\,x\,y\right)+4\,T\left(5+x\,y\right)+2\,T^2\left(-9+2\,x\,y\right)\right)\,\epsilon,$$

$$-\frac{T}{2-5\,T+2\,T^2}+\frac{1}{\left(2-5\,T+2\,T^2\right)^3}$$
$$T\left(5-3\,T^4-4\,a\left(-2+5\,T-5\,T^3+2\,T^4\right)+8\,x\,y-4\,T\left(4+3\,x\,y\right)-2\,T^2\left(-5+6\,x\,y\right)+T^3\left(4+8\,x\,y\right)\right)\,\epsilon,$$

$$-\frac{T^2}{1-3\,T+3\,T^2-3\,T^3+T^4}-\Big(T^2\left(-3+T^8+2\,a\left(-2+9\,T-15\,T^2+12\,T^3-12\,T^5+15\,T^6-9\,T^7+2\,T^8\right)-\right.$$
$$4\,x\,y+T^5\left(4-16\,x\,y\right)+8\,T^4\left(-2+x\,y\right)+4\,T^3\left(7+2\,x\,y\right)-T^7\left(3+4\,x\,y\right)-$$
$$\left.4\,T^2\left(7+4\,x\,y\right)+2\,T^6\left(1+7\,x\,y\right)+T\left(15+14\,x\,y\right)\right)\,\epsilon\Big)\Big/\left(1-3\,T+3\,T^2-3\,T^3+T^4\right)^3,$$

$$\frac{T^2}{1-3T+5T^2-3T^3+T^4}+\frac{T^2\left(2-T-T^2+2T^3\right)\left(-1+2a\left(-1+T\right)+T-2xy\right)\epsilon}{\left(1-3T+5T^2-3T^3+T^4\right)^2},$$

$$\frac{T^3}{1-T+T^2-T^3+T^4-T^5+T^6}+\frac{1}{\left(1-T+T^2-T^3+T^4-T^5+T^6\right)^3}$$
$$T^3\left(15T^5-12T^6+2a\left(-3+5T-6T^2+6T^3-5T^4+3T^5-3T^7+5T^8-6T^9+6T^{10}-5T^{11}+3T^{12}\right)+\right.$$
$$T^9\left(4-8xy\right)+T^{11}\left(1-6xy\right)+T^7\left(9-6xy\right)-6\left(1+xy\right)+4T^3\left(4+xy\right)-$$
$$\left.2T^4\left(8+3xy\right)+T^8\left(-6+4xy\right)+T^{10}\left(-2+4xy\right)-2T^2\left(7+4xy\right)+T\left(11+4xy\right)\right)\epsilon,$$

$$\frac{T}{3-5T+3T^2}+\frac{1}{\left(3-5T+3T^2\right)^3}T\left(-23-5T^4+6a\left(-3+5T-5T^3+3T^4\right)-18xy+\right.$$
$$\left.T^3\left(29-18xy\right)+12T^2\left(-5+xy\right)+T\left(59+12xy\right)\right)\epsilon,\ \frac{T^2}{2-3T+3T^2-3T^3+2T^4}+$$
$$\left(T^2\left(1+17T^8+2a\left(-8+18T-21T^2+15T^3-15T^5+21T^6-18T^7+8T^8\right)-16xy+T^2\left(20-22xy\right)+\right.\right.$$
$$8T^4\left(7+xy\right)-4T^7\left(11+4xy\right)+4T\left(-2+5xy\right)+T^3\left(-37+8xy\right)+T^6\left(62+20xy\right)-$$
$$\left.\left.T^5\left(67+22xy\right)\right)\epsilon\right)\Big/\left(2-3T+3T^2-3T^3+2T^4\right)^3,\ \frac{T}{4-7T+4T^2}+\frac{1}{\left(4-7T+4T^2\right)^3}$$
$$4T\left(2+10T^4+2a\left(-4+7T-7T^3+4T^4\right)-8xy+T\left(-13+6xy\right)+T^2\left(28+6xy\right)-T^3\left(27+8xy\right)\right)\epsilon,$$

$$\frac{T^2}{2-4T+5T^2-4T^3+2T^4}+\left(T^2\left(-17-T^8+8a\left(-2+6T-9T^2+7T^3-7T^5+9T^6-6T^7+2T^8\right)-\right.\right.$$
$$16xy+T^5\left(74-40xy\right)+2T^4\left(-57+8xy\right)-2T^7\left(-5+8xy\right)+2T^3\left(65+8xy\right)-$$
$$\left.\left.2T^2\left(53+20xy\right)+T^6\left(-34+32xy\right)+T\left(58+32xy\right)\right)\epsilon\right)\Big/\left(2-4T+5T^2-4T^3+2T^4\right)^3,$$

$$-\frac{T^2}{1-5T+7T^2-5T^3+T^4}-\left(T^2\left(-3+T^8+a\left(-4+30T-78T^2+80T^3-80T^5+78T^6-30T^7+4T^8\right)-\right.\right.$$
$$4xy+T^5\left(26-52xy\right)-T^7\left(5+4xy\right)+2T^3\left(53+14xy\right)+T^6\left(3+26xy\right)+$$
$$\left.\left.T\left(25+26xy\right)+T^4\left(-78+28xy\right)-T^2\left(75+52xy\right)\right)\epsilon\right)\Big/\left(1-5T+7T^2-5T^3+T^4\right)^3,$$

$$\frac{T^2}{1-5T+9T^2-5T^3+T^4}+\left(T^2\left(-2+2T^8+2a\left(-2+15T-43T^2+50T^3-50T^5+43T^6-15T^7+2T^8\right)-\right.\right.$$
$$4xy-20T^2\left(2+3xy\right)-T^7\left(15+4xy\right)+4T^3\left(9+10xy\right)-4T^5\left(16+15xy\right)+$$
$$\left.\left.T\left(15+26xy\right)+T^6\left(46+26xy\right)+T^4\left(22+40xy\right)\right)\epsilon\right)\Big/\left(1-5T+9T^2-5T^3+T^4\right)^3\Big\}$$