

```
In[ ]:= SetDirectory["C:\\drorbn\\AcademicPensieve\\Projects\\APAI"];
```

```
In[ ]:= Once[<< KnotTheory` ; << Rot.m];
Once[Get@". /Profile/Profile.m"];
BeginProfile[];
```

Loading KnotTheory` version of February 2, 2020, 10:53:45.2097.

Read more at <http://katlas.org/wiki/KnotTheory>.

Loading Rot.m from <http://drorbn.net/APAI> to compute rotation numbers.

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

This version: April 2020. Original version: July 1994.

```
In[ ]:= R1[s_, i_, j_] := s (gji (gj*,j + gj*,j* - gij) - gii (gj*,j* - 1) - 1 / 2);
ρ[K_] := PP_ρ@Module[{Cs, φ, n, A, s, i, j, k, Δ, G, ρ1, res},
  PP_Init@({Cs, φ} = Rot[K]; n = Length[Cs];
  A = IdentityMatrix[2 n + 1];
  Cases[Cs, {s_, i_, j_} => (A[[{i, j}, {i + 1, j + 1}] += (
    -T^s T^s - 1
  ))];
  PP_Δ@"(Δ = T^(-Total[φ] - Total[Cs[[All, 1]])] / 2 Det[A]);
  PP_G@"(G = Inverse[A]);
  PP_ρ1@"(ρ1 = Sum[k=1, n] R1@@Cs[[k]] - Sum[k=1, 2^n] φ[[k]] (gkk - 1 / 2);
  res = Factor@{Δ, Δ^2 ρ1 /. α_+ => α + 1 /. gα_, β_ => G[[α, β]]}
];
```

```
In[ ]:= GST48 = EPD[X14,1, X̄2,29, X3,40, X43,4, X̄26,5, X6,95, X96,7, X13,8, X̄9,28, X10,41, X42,11, X̄27,12,
X30,15, X̄16,61, X̄17,72, X̄18,83, X19,34, X̄89,20, X̄21,92, X̄79,22, X̄68,23, X̄57,24, X̄25,56, X62,31,
X73,32, X84,33, X̄50,35, X36,81, X37,70, X38,59, X̄39,54, X44,55, X58,45, X69,46, X80,47, X48,91,
X90,49, X51,82, X52,71, X53,60, X̄63,74, X̄64,85, X̄76,65, X̄87,66, X̄67,94, X̄75,86, X̄88,77, X̄78,93];
```

```
In[ ]:= ρ[GST48]
```

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

In[]:= **PrintProfile**[]

```
Out[ ]:= ProfileRoot is root. Profiled time: 81.828
( 1) 0.078/ 81.828 above ρ
G: called 1 times, time in 81.484/81.484
( 1) 81.484/ 81.484 under ρ
Δ: called 1 times, time in 0.172/0.172
( 1) 0.172/ 0.172 under ρ
ρ1: called 1 times, time in 0.078/0.078
( 1) 0.078/ 0.078 under ρ
ρ: called 1 times, time in 0.078/81.828
( 1) 0.078/ 81.828 under ProfileRoot
( 1) 81.484/ 81.484 above G
( 1) 0.172/ 0.172 above Δ
( 1) 0.078/ 0.078 above ρ1
( 1) 0.016/ 0.016 above Init
Init: called 1 times, time in 0.016/0.016
( 1) 0.016/ 0.016 under ρ
```

```
In[ ]:= R1[s_, i_, j_] := s (gji (gj*,j + gj,j* - gij) - gii (gj,j* - 1) - 1 / 2);
ρ[K_] := PPρ@Module[{Cs, φ, n, A, s, i, j, k, Δ, G, ρ1, res},
  PPInit@({Cs, φ} = Rot[K]; n = Length[Cs];
  A = IdentityMatrix[2 n + 1];
  Cases[Cs, {s_, i_, j_} => (A[[{i, j}, {i + 1, j + 1}]] += ( -T^s T^s - 1 ))];
  A = SparseArray@A;
  PPΔ^n@ (Δ = T^(-Total[φ] - Total[Cs[[All, 1]]]) / 2 Det[A]);
  PPG^n@ (G = Inverse[A]);
  PPρ1^n@ (ρ1 = Sum[k=1]^n R1 @@ Cs[[k]] - Sum[k=1]^2^n φ[[k]] (gkk - 1 / 2);
  res = Factor@{Δ, Δ^2 ρ1 /. α_+ => α + 1 /. gα_,β_ => G[[α, β]}}]
];
```

In[]:= **BeginProfile**[];

In[]:= ρ[GST48]

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

```
In[ ]:= PrintProfile[ ]
```

```
Out[ ]:= ProfileRoot is root. Profiled time: 82.328  
  ( 1)  0.078/ 82.328 above  $\rho$   
G: called 1 times, time in 82./82.  
  ( 1)  82.000/ 82.000 under  $\rho$   
 $\Delta$ : called 1 times, time in 0.157/0.157  
  ( 1)  0.157/ 0.157 under  $\rho$   
 $\rho_1$ : called 1 times, time in 0.078/0.078  
  ( 1)  0.078/ 0.078 under  $\rho$   
 $\rho$ : called 1 times, time in 0.078/82.328  
  ( 1)  0.078/ 82.328 under ProfileRoot  
  ( 1)  82.000/ 82.000 above G  
  ( 1)  0.157/ 0.157 above  $\Delta$   
  ( 1)  0.078/ 0.078 above  $\rho_1$   
  ( 1)  0.015/ 0.015 above Init  
Init: called 1 times, time in 0.015/0.015  
  ( 1)  0.015/ 0.015 under  $\rho$ 
```