Pensieve header: Experimental analysis to degree 12.

Loading Data Files

```
SetDirectory["C:\\drorbn\\AcademicPensieve\\Talks\\UNC-1610"];
Once[<< KnotTheory`];
tab = Join[
   {Knot[0, 1] → {0., 𝔼[1, 0, 0, 0]}}, (* Computed by hand *)
   Get["../../2016-09/tab.m"],
   (* Computed in http://drorbn.net/AcademicPensieve/2016-09/OneSmidgen.nb *)
   Get["../../2016-09/tab11.m"], (* Computed in http://
    drorbn.net/AcademicPensieve/2016-09/1co11.nb *)
   Get["../../2016-10/tab12.m"], (* Computed in http://
    drorbn.net/AcademicPensieve/2016-10/1co12.nb *)
   Get["../../2016-09/TKTable.m"], (* Computed in http://
    drorbn.net/AcademicPensieve/2016-09/1co4TorusKnots.nb *)
   {GST[48] → {16149.016`, 𝔼[13 - 1/t^8 + 2/t^7 - 1/t^6 - 2/t^4 + 5/t^3 - 2/t^2 - 7/t - 7 t - 2 t^2 + 5 t^3 - 2 t^4 -
        t^6 + 2 t^7 - t^8, 0, 0, 224956 + 8628 c + 13/t^32 - 16 c/t^32 - 110/t^31 + 120 c/t^31 + 426/t^30 - 385 c/t^30 - 1006/t^29 +
        676 c/t^29 + 1690/t^28 - 784 c/t^28 - 2449/t^27 + 1198 c/t^27 + 3698/t^26 - 5793 c/(2 t^26) - 5392/t^25 + 9569 c/(2 t^25) + 5807/t^24 -
        2918 c/t^24 - 3039/t^23 - 3274 c/t^23 - 1952/t^22 + 11923 c/(2 t^22) + 7062/t^21 - 646 c/t^21 - 13976/t^20 + 5229 c/(2 t^20) + 24036/t^19 -
        29531 c/t^19 - 27865/t^18 + 58335 c/t^18 + 14568/t^17 - 36499 c/t^17 + 1523/t^16 - 31212 c/t^16 + 9189/t^15 + 55648 c/t^15 -
        32806/t^14 + 9749 c/(2 t^14) + 6572/t^13 - 67387 c/(2 t^13) + 70356/t^12 - 91406 c/t^12 - 71698/t^11 + 500701 c/(2 t^11) - 87333/t^10 -
        361145 c/(2 t^10) + 229431/t^9 - 115093 c/t^9 - 53565/t^8 + 575659 c/(2 t^8) - 413089/t^7 - 255051 c/(2 t^7) + 688179/t^6 -
        190615 c/(2 t^6) - 367037/t^5 + 60617 c/(2 t^5) - 313161/t^4 + 394233 c/(2 t^4) + 687947/t^3 - 191058 c/t^3 - 442972/t^2 -
        58548 c/t^2 - 49189/t + 162150 c/t + 38417 t - 219015 c t/2 - 389878 t^2 - 149991 c t^2/2 +
        442865 t^3 + 253710 c t^3 - 111675 t^4 - 126942 c t^4 - 381647 t^5 - 97032 c t^5 + 691047 t^6 +
        51156 c t^6 - 589895 t^7 + 344873 c t^7/2 + 162331 t^8 - 341955 c t^8/2 + 248205 t^9 -
        233899 c t^9/2 - 356293 t^10 + 636481 c t^10/2 + 194810 t^11 - 389149 c t^11/2 - 16686 t^12 -
        46825 c t^12 - 15840 t^13 + 221599 c t^13/2 - 37762 t^14 - 22403 c t^14/2 + 49359 t^15 - 44534 c t^15 +
        2371 t^16 - 24259 c t^16/2 - 46496 t^17 + 141789 c t^17/2 + 39311 t^18 - 51698 c t^18 - 7048 t^19 -
        976 c t^19 - 9696 t^20 + 20285 c t^20 + 5130 t^21 - 6909 c t^21 + 2778 t^22 - 3177 c t^22 -
        3453 t^23 - 2503 c t^23/2 + 467 t^24 + 6626 c t^24 + 708 t^25 - 9737 c t^25/2 + 110 t^26 + 728 c t^26 -
        775 t^27 + 748 c t^27 + 598 t^28 - 447 c t^28/2 - 194 t^29 - 241 c t^29/2 + 6 t^30 - 56 c t^30 + 14 t^31 +
```

```
        184 c t^31 - 3 t^32 - 120 c t^32 + 35 c t^33 - 4 c t^34 - 138459 u w/2 + 16 u w/t^32 - 104 u w/t^31 +
        281 u w/t^30 - 395 u w/t^29 + 389 u w/t^28 - 809 u w/t^27 + 4175 u w/(2 t^26) - 2697 u w/t^25 + 221 u w/t^24 + 3495 u w/t^23 -
        4933 u w/(2 t^22) - 3641 u w/(2 t^21) - 4435 u w/t^20 + 25096 u w/t^19 - 33239 u w/t^18 + 3260 u w/t^17 + 34472 u w/t^16 -
        21176 u w/t^15 - 52101 u w/(2 t^14) + 7643 u w/t^13 + 99049 u w/t^12 - 302603 u w/(2 t^11) + 29271 u w/t^10 + 144364 u w/t^9 -
        286931 u w/(2 t^8) - 15940 u w/t^7 + 158735 u w/(2 t^6) + 49059 u w/t^5 - 296115 u w/(2 t^4) + 86001 u w/(2 t^3) +
        203097 u w/(2 t^2) - 121203 u w/(2 t) + 40278 t u w + 230547/2 t^2 u w - 276873/2 t^3 u w - 22989/2 t^4 u w +
        171075/2 t^5 u w + 68763/2 t^6 u w - 138055 t^7 u w + 65845/2 t^8 u w + 149872 t^9 u w -
        336737/2 t^10 u w + 26206 t^11 u w + 73031 t^12 u w - 75537/2 t^13 u w - 26567 t^14 u w +
        17967 t^15 u w + 60193/2 t^16 u w - 40798 t^17 u w + 10900 t^18 u w + 11876 t^19 u w - 8409 t^20 u w -
        1500 t^21 u w + 1677 t^22 u w + 5857/2 t^23 u w - 7395/2 t^24 u w + 1171 t^25 u w + 443 t^26 u w -
        305 t^27 u w - 163/2 t^28 u w + 39 t^29 u w + 95 t^30 u w - 89 t^31 u w + 31 t^32 u w - 4 t^33 u w]}}
    (* Computed in http://drorbn.net/AcademicPensieve/2016-09/GST48.nb *)
  ];
tab /. (K_ -> {_, z_}) :> (z1[K] = z);
AllKs = First /@ tab;
Ribbons = {Knot[0, 1], Knot[6, 1], Knot[8, 8], Knot[8, 9], Knot[8, 20], Knot[9, 27],
   Knot[9, 41], Knot[9, 46], Knot[10, 3], Knot[10, 22], Knot[10, 35], Knot[10, 42],
   Knot[10, 48], Knot[10, 75], Knot[10, 87], Knot[10, 99], Knot[10, 123],
   Knot[10, 129], Knot[10, 137], Knot[10, 140], Knot[10, 153], Knot[10, 155]};
(* From Kawauchi via Andrey Khesin *)
```

```
Loading KnotTheory` version of September 6, 2014, 13:37:37.2841.
Read more at http://katlas.org/wiki/KnotTheory.
```

```
z1[Knot[3, 1]]
```

$$\mathbb{E}\Big[-1+\frac{1}{t}+t,\ 0,\ 0,\ 16+\frac{9\,c}{2}+\frac{2}{t^4}-\frac{2\,c}{t^4}-\frac{7}{t^3}+\frac{11\,c}{2\,t^3}+\frac{14}{t^2}-\frac{8\,c}{t^2}-\frac{18}{t}+\frac{4\,c}{t}-10\,t-10\,c\,t+4\,t^2+8\,c\,t^2-t^3-\frac{3\,c\,t^3}{2}-2\,c\,t^4+2\,c\,t^5-\frac{c\,t^6}{2}-4\,u\,w+\frac{2\,u\,w}{t^4}-\frac{7\,u\,w}{2\,t^3}+\frac{9\,u\,w}{2\,t^2}+\frac{u\,w}{2\,t}+6\,t\,u\,w-2\,t^2\,u\,w-\frac{1}{2}\,t^3\,u\,w+\frac{3}{2}\,t^4\,u\,w-\frac{1}{2}\,t^5\,u\,w\Big]$$

```
Length@AllKs
```

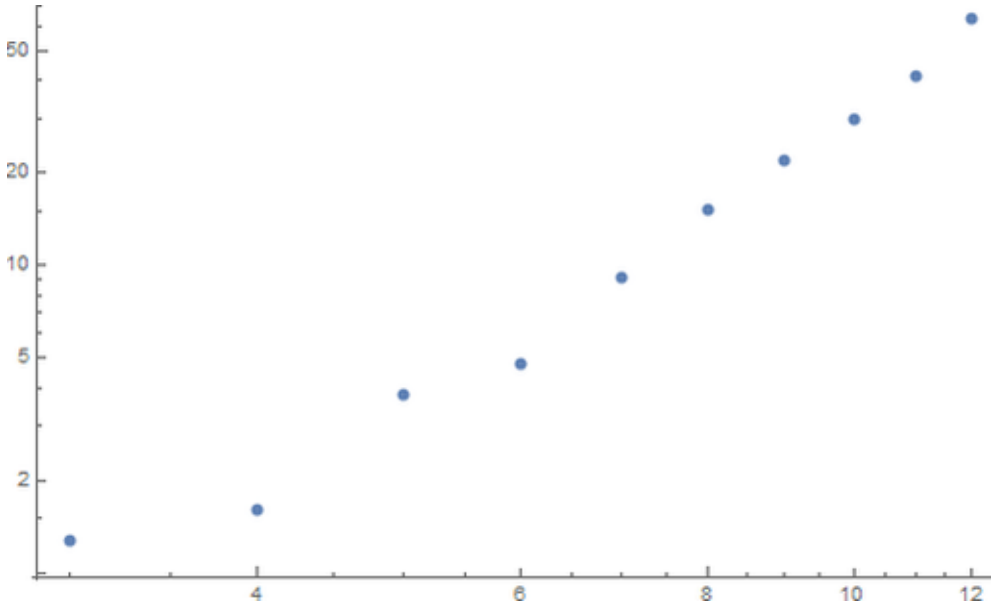
```
3030
```

Computation Times

```
Table[{n, Mean[First /@ (AllKnots[n] /. tab)]}, {n, 3, 12}]
```

```
{{3, 1.28125}, {4, 1.60938}, {5, 3.79688}, {6, 4.78646}, {7, 9.16518},
 {8, 15.2173}, {9, 22.1295}, {10, 29.8425}, {11, 41.5806}, {12, 64.0039}}
```

```
MakeImage["To12Times",
 ListLogLogPlot@Table[{n, Mean[First /@ (AllKnots[n] /. tab)]}, {n, 3, 12}],
 ImageSize → 480
]
```



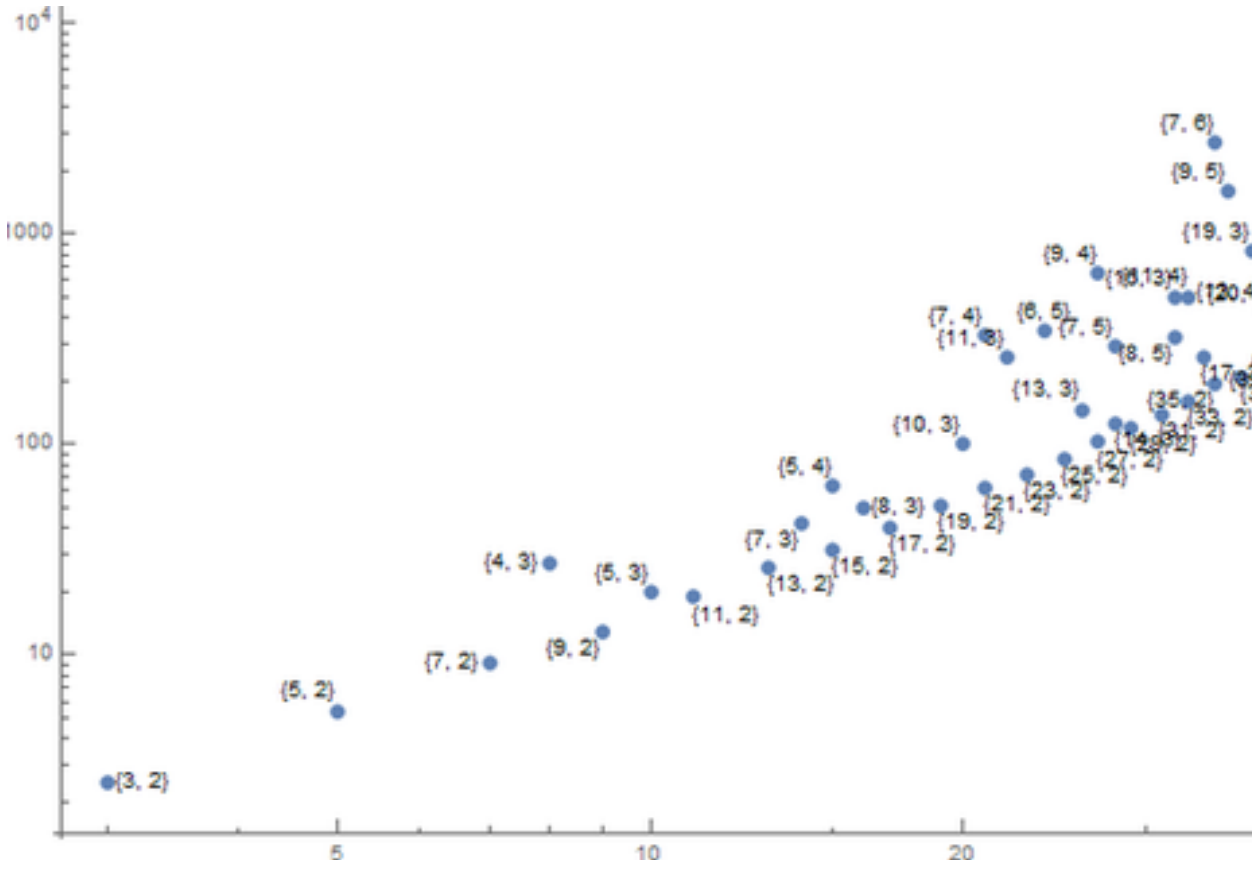

```
Export["To12Times.pdf",
 ListLogLogPlot@Table[{n, Mean[First /@ (AllKnots[n] /. tab)]}, {n, 3, 12}]]
```

```
To12Times.pdf
```

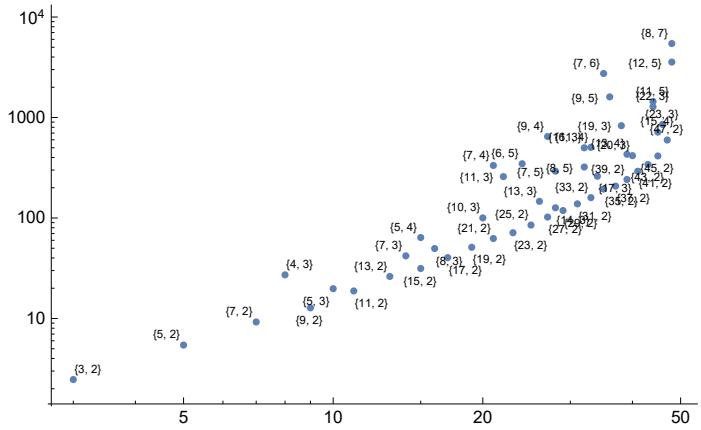
```
Cases[tab, (TorusKnot[n_, k_] → {t_, z_}) :> Labeled[{n (k - 1), t}, {n, k}]]
```

```
{ {3, 2.46875}, {5, 5.4375}, {7, 9.23438}, {8, 27.1875}, {9, 12.7656}, {10, 19.7969},
    {3, 2}        {5, 2}        {7, 2}        {4, 3}        {9, 2}         {5, 3}
 {11, 18.7969}, {13, 26.2031}, {14, 42.0156}, {15, 63.9063}, {15, 31.4531},
    {11, 2}        {13, 2}        {7, 3}         {5, 4}         {15, 2}
 {16, 49.6875}, {17, 40.3438}, {19, 51.1563}, {20, 100.219}, {21, 333.266},
    {8, 3}         {17, 2}        {19, 2}        {10, 3}         {7, 4}
 {21, 62.5156}, {22, 258.234}, {23, 71.375}, {24, 346.688}, {25, 85.0781},
    {21, 2}        {11, 3}        {23, 2}        {6, 5}         {25, 2}
 {26, 146.563}, {27, 646.391}, {27, 102.219}, {28, 292.828}, {28, 126.453},
    {13, 3}        {9, 4}         {27, 2}        {7, 5}         {14, 3}
 {29, 118.641}, {31, 138.297}, {32, 321.781}, {32, 499.703}, {33, 504.656},
    {29, 2}        {31, 2}        {8, 5}         {16, 3}         {11, 4}
 {33, 159.5}, {34, 260.484}, {35, 2741.34}, {35, 194.156}, {36, 1604.94},
   {33, 2}       {17, 3}        {7, 6}         {35, 2}         {9, 5}
 {37, 207.734}, {38, 829.406}, {39, 431.}, {39, 241.531}, {40, 417.344},
    {37, 2}        {19, 3}       {13, 4}       {39, 2}         {20, 3}
 {41, 292.016}, {43, 340.703}, {44, 1444.63}, {44, 1279.39}, {45, 715.625},
    {41, 2}        {43, 2}        {11, 5}        {22, 3}         {15, 4}
 {45, 414.5}, {46, 853.156}, {47, 597.203}, {48, 5446.38}, {48, 3562.98}}
   {45, 2}       {23, 3}        {47, 2}        {8, 7}         {12, 5}
```

```
MakeImage["TKTimes",
 ListLogLogPlot@
  Cases[tab, (TorusKnot[n_, k_] → {t_, z_}) :> Labeled[{n (k - 1), t}, ToString@{n, k}]],
 ImageSize → 640
]
```




```
ListLogLogPlot@Cases[tab,
  (TorusKnot[n_, k_] → {t_, z_}) :> Labeled[{n (k - 1), t}, Style[ToString@{n, k}, Tiny]]]
```



```
Export["TKTimes.pdf",
 ListLogLogPlot@Cases[tab, (TorusKnot[n_, k_] → {t_, z_}) :>
    Labeled[{n (k - 1), t}, Style[ToString@{n, k}, Tiny]]]
]
```

TKTimes.pdf

The Essence

```
𝔼 /: 𝔼[ω1_, L1_, Q1_, P1_] ≡ 𝔼[ω2_, L2_, Q2_, P2_] :=
  Expand@Together@(ω1 == ω2 ∧ L1 == L2 ∧ Q1 == Q2 ∧ P1 == P2);
```

```
al[K_] := z1[K][[1]];
ap[K_] := al[K] /. t^n_. /; n < 0 :> 0;
```

```
al /@ AllKnots[{0, 5}]
```

$$\left\{1, -1+\frac{1}{t}+t, 3-\frac{1}{t}-t, 1+\frac{1}{t^2}-\frac{1}{t}-t+t^2, -3+\frac{2}{t}+2t\right\}$$

```
ap /@ AllKnots[{0, 5}]
```

$$\left\{1, -1+t, 3-t, 1-t+t^2, -3+2t\right\}$$

```
e[K_] := e[K] = Expand[Together[(t z1[K][[4]] /. c | u | w → 0) + al[K]^3 t^2 D[al[K], t] / ((t - 1)^2 al[K]^2)]];
ep[K_] := e[K] /. t^n_. /; n < 0 :> 0;
```

```
e /@ AllKnots[{0, 5}]
```

$$\left\{0, \frac{1}{t}+t, 0, \frac{2}{t^3}+\frac{3}{t}+3t+2t^3, -4+\frac{5}{t}+5t\right\}$$

```
ep /@ AllKnots[{0, 5}]
```

$$\left\{0, t, 0, 3t+2t^3, -4+5t\right\}$$

```
Union@Table[e[K] == ep[K] + (ep[K] /. t → 1/t) - (ep[K] /. t → 0), {K, AllKs}]
```

{True}

```
Union@Table[
  z1[K] ≡ 𝔼[al[K], 0, 0,
    al[K]^2 ((t - 2 + t^-1) e[K] + t al[K] D[al[K], t] ((4 + t - t^2) (u w + (t - 1) c) / (2 (t - 1)) - 1))],
  {K,
   AllKs}]
```

{True}

Power

```
Length@AllKnots[{0, 10}]
```

```
250
```

```
Length@Union@Table[{ap[K], ep[K]}, {K, AllKnots[{0, 10}]}]
```

```
250
```

```
Length@Union@Table[{Kh[K], HOMFLYPT[K]}, {K, AllKnots[{0, 10}]}]
```

```
KnotTheory: Loading precomputed data in Kh4Knots`.
KnotTheory: Loading precomputed data in PD4Knots`.
KnotTheory: The HOMFLYPT program was written by Scott Morrison.
249
```

```
Length@Union@Table[{Kh[K], HOMFLYPT[K], Kauffman[K]}, {K, AllKnots[{0, 10}]}]
```

```
KnotTheory: Loading precomputed data in Kauffman4Knots`.
250
```

```
Length@AllKnots[{0, 11}]
```

```
802
```

```
Length@Union@Table[{ap[K], ep[K]}, {K, AllKnots[{0, 11}]}]
```

```
788
```

```
Length@Union@Table[{Kh[K], HOMFLYPT[K]}, {K, AllKnots[{0, 11}]}]
```

```
KnotTheory: Loading precomputed data in Kh4Knots11`.
KnotTheory: Loading precomputed data in DTCode4KnotsTo11`.
KnotTheory: The GaussCode to PD conversion was written by Siddarth Sankaran at the University of Toronto in the summer of
            2005.
772
```

```
Length@Union@Table[{Kh[K], HOMFLYPT[K], Kauffman[K]}, {K, AllKnots[{0, 11}]}]
```

```
KnotTheory: Loading precomputed data in Kauffman4Knots11`.
787
```

```
Length@Union@Table[{ap[K], ep[K], Kh[K], HOMFLYPT[K]}, {K, AllKnots[{0, 11}]}]
```

```
788
```

```
Length@AllKnots[{0, 12}]
```

```
2978
```

```
Length@Union@Table[{ap[K], ep[K]}, {K, AllKnots[{0, 12}]}]
```

2883

```
Length@Union@Table[{Kh[K], HOMFLYPT[K]}, {K, AllKnots[{0, 12}]}]
```

KnotTheory: Loading precomputed data in KnotTheory/12A.dts.

KnotTheory: The Khovanov homology program JavaKh–v2 is an update of Jeremy Green's program JavaKh–v1, written by Scott Morrison in 2008 at Microsoft Station Q.

KnotTheory: Loading precomputed data in KnotTheory/12N.dts.

2786

```
Length@Union@Table[{Kh[K], HOMFLYPT[K], Kauffman[K]}, {K, AllKnots[{0, 12}]}]
```

KnotTheory: The Kauffman polynomial program was written by Scott Morrison.

2882

```
Length@Union@Table[{ap[K], ep[K], Kh[K], HOMFLYPT[K]}, {K, AllKnots[{0, 12}]}]
```

2885

Genus

```
Select[AllKnots[{0, 12}], 2 ThreeGenus[#] - 1 == Exponent[ep[#], t] &] // Length
```

KnotTheory: The 3–genus data known to KnotTheory` is taken from Charles Livingston's http://www.indiana.edu/~knotinfo/.

KnotTheory: Loading precomputed data in IndianaData`.

KnotTheory: The three genus program was written by Jake Rasmussen of Princeton University.

... Get: Cannot open DiscreteMath`Combinatorica`.

... Needs: Context DiscreteMath`Combinatorica` was not created when Needs was evaluated.

... Get: Cannot open DiscreteMath`Combinatorica`.

... Needs: Context DiscreteMath`Combinatorica` was not created when Needs was evaluated.

... Get: Cannot open DiscreteMath`Combinatorica`.

... General: Further output of Get::noopen will be suppressed during this calculation.

... Needs: Context DiscreteMath`Combinatorica` was not created when Needs was evaluated.

... General: Further output of Needs::nocont will be suppressed during this calculation.

2530

```
AllKnots[{0, 12}] // Length
```

2978

```
2978 - 2530
```

448

```
Select[AllKnots[{0, 12}], 2 ThreeGenus[#] - 1 < Exponent[ep[#], t] &]
```

```
{}
```

```
af = Select[AllKnots[{0, 12}], ThreeGenus[#] =!= Exponent[ap[#], t] &]
```

```
{Knot[11, NonAlternating, 34], Knot[11, NonAlternating, 42],
 Knot[11, NonAlternating, 45], Knot[11, NonAlternating, 67], Knot[11, NonAlternating, 73],
 Knot[11, NonAlternating, 97], Knot[11, NonAlternating, 152], Knot[12, NonAlternating, 23],
 Knot[12, NonAlternating, 28], Knot[12, NonAlternating, 31], Knot[12, NonAlternating, 51],
 Knot[12, NonAlternating, 56], Knot[12, NonAlternating, 63], Knot[12, NonAlternating, 87],
 Knot[12, NonAlternating, 124], Knot[12, NonAlternating, 129],
 Knot[12, NonAlternating, 132], Knot[12, NonAlternating, 221],
 Knot[12, NonAlternating, 231], Knot[12, NonAlternating, 256],
 Knot[12, NonAlternating, 257], Knot[12, NonAlternating, 264],
 Knot[12, NonAlternating, 267], Knot[12, NonAlternating, 268],
 Knot[12, NonAlternating, 293], Knot[12, NonAlternating, 313],
 Knot[12, NonAlternating, 321], Knot[12, NonAlternating, 411],
 Knot[12, NonAlternating, 430], Knot[12, NonAlternating, 457],
 Knot[12, NonAlternating, 519], Knot[12, NonAlternating, 665],
 Knot[12, NonAlternating, 750], Knot[12, NonAlternating, 808],
 Knot[12, NonAlternating, 812], Knot[12, NonAlternating, 830]}
```

```
Column@Table[{K, g = ThreeGenus[K], Exponent[ap[K], t],
   Exponent[ep[K], t], Exponent[ep[K], t] == 2 g - 1}, {K, af}]
```

```
{Knot[11, NonAlternating, 34], 3, 0, 2, False}
{Knot[11, NonAlternating, 42], 2, 0, 2, False}
{Knot[11, NonAlternating, 45], 3, 2, 3, False}
{Knot[11, NonAlternating, 67], 2, 1, 2, False}
{Knot[11, NonAlternating, 73], 3, 2, 2, False}
{Knot[11, NonAlternating, 97], 2, 1, 2, False}
{Knot[11, NonAlternating, 152], 3, 2, 3, False}
{Knot[12, NonAlternating, 23], {1, 2}, 1, 3, 3 == {1, 3}}
{Knot[12, NonAlternating, 28], 3, 2, 3, False}
{Knot[12, NonAlternating, 31], 3, 1, 3, False}
{Knot[12, NonAlternating, 51], 2, 1, 2, False}
{Knot[12, NonAlternating, 56], 3, 2, 2, False}
{Knot[12, NonAlternating, 63], 3, 2, 3, False}
{Knot[12, NonAlternating, 87], 3, 2, 3, False}
{Knot[12, NonAlternating, 124], {1, 2}, 1, 3, 3 == {1, 3}}
{Knot[12, NonAlternating, 129], 3, 1, 3, False}
{Knot[12, NonAlternating, 132], 3, 2, 3, False}
{Knot[12, NonAlternating, 221], 3, 2, 2, False}
{Knot[12, NonAlternating, 231], 3, 2, 3, False}
{Knot[12, NonAlternating, 256], 3, 2, 4, False}
{Knot[12, NonAlternating, 257], 3, 2, 4, False}
{Knot[12, NonAlternating, 264], 3, 2, 4, False}
{Knot[12, NonAlternating, 267], 3, 2, 4, False}
{Knot[12, NonAlternating, 268], 2, 1, 2, False}
{Knot[12, NonAlternating, 293], 2, 1, 3, True}
{Knot[12, NonAlternating, 313], 2, 0, 2, False}
{Knot[12, NonAlternating, 321], 2, 1, 3, True}
{Knot[12, NonAlternating, 411], 2, 1, 3, True}
{Knot[12, NonAlternating, 430], 2, 0, 2, False}
{Knot[12, NonAlternating, 457], 2, 1, 3, True}
{Knot[12, NonAlternating, 519], {1, 2}, 1, 3, 3 == {1, 3}}
{Knot[12, NonAlternating, 665], {2, 3}, 2, 4, 4 == {3, 5}}
{Knot[12, NonAlternating, 750], 3, 2, 5, True}
{Knot[12, NonAlternating, 808], 3, 2, 3, False}
{Knot[12, NonAlternating, 812], 3, 2, 4, False}
{Knot[12, NonAlternating, 830], 3, 2, 5, True}
```

```
Select[af, 2 ThreeGenus[#] - 1 == Exponent[ep[#], t] &]
```

```
{Knot[12, NonAlternating, 293], Knot[12, NonAlternating, 321],
 Knot[12, NonAlternating, 411], Knot[12, NonAlternating, 457],
 Knot[12, NonAlternating, 750], Knot[12, NonAlternating, 830]}
```

GST48

```
ap[GST[48]]
```

$$13 - 7\,t - 2\,t^2 + 5\,t^3 - 2\,t^4 - t^6 + 2\,t^7 - t^8$$

```
ep[GST[48]]
```

$$-36 - 11\,t + 148\,t^2 - 226\,t^3 + 132\,t^4 + 108\,t^5 - 242\,t^6 + 166\,t^7 - 8\,t^8 - 62\,t^9 + 42\,t^{10} + 2\,t^{11} - 32\,t^{12} + 33\,t^{13} - 18\,t^{14} + 5\,t^{15}$$

Misc

```
Expand[(t - 2 + t^-1) e[#]] & /@ AllKnots[{3, 7}] // Column
```

$2 + \frac{1}{t^2} - \frac{2}{t} - 2\,t + t^2$

0

$6 + \frac{2}{t^4} - \frac{4}{t^3} + \frac{5}{t^2} - \frac{6}{t} - 6\,t + 5\,t^2 - 4\,t^3 + 2\,t^4$

$18 + \frac{5}{t^2} - \frac{14}{t} - 14\,t + 5\,t^2$

$10 + \frac{1}{t^2} - \frac{6}{t} - 6\,t + t^2$

$16 + \frac{1}{t^4} - \frac{6}{t^3} + \frac{13}{t^2} - \frac{16}{t} - 16\,t + 13\,t^2 - 6\,t^3 + t^4$

0

$12 + \frac{3}{t^6} - \frac{6}{t^5} + \frac{8}{t^4} - \frac{10}{t^3} + \frac{11}{t^2} - \frac{12}{t} - 12\,t + 11\,t^2 - 10\,t^3 + 8\,t^4 - 6\,t^5 + 3\,t^6$

$60 + \frac{14}{t^2} - \frac{44}{t} - 44\,t + 14\,t^2$

$-56 - \frac{9}{t^4} + \frac{26}{t^3} - \frac{41}{t^2} + \frac{52}{t} + 52\,t - 41\,t^2 + 26\,t^3 - 9\,t^4$

$-112 - \frac{24}{t^2} + \frac{80}{t} + 80\,t - 24\,t^2$

$114 + \frac{9}{t^4} - \frac{34}{t^3} + \frac{70}{t^2} - \frac{102}{t} - 102\,t + 70\,t^2 - 34\,t^3 + 9\,t^4$

$78 + \frac{1}{t^4} - \frac{10}{t^3} + \frac{36}{t^2} - \frac{66}{t} - 66\,t + 36\,t^2 - 10\,t^3 + t^4$

$-22 - \frac{3}{t^2} + \frac{14}{t} + 14\,t - 3\,t^2$

```
TimeUsed[]
```

```
4525.16
```