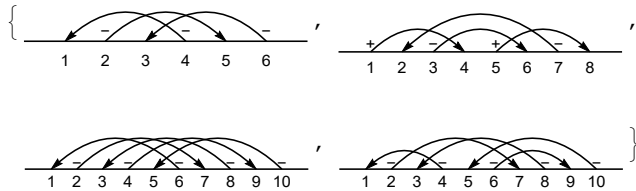


```
<< KnotTheory`
Loading KnotTheory` version
of September 6, 2014, 13:37:37.2841.
Read more at http://katlas.org/wiki/KnotTheory.
```

```
GD[g_GD] := g;
GD[L_] := GD@@PD[L] /.
  X[i_, j_, k_, l_] => If[PositiveQ@X[i, j, k, l],
    Ap_{i,i}, Am_{j,i}];
Draw[g_GD] := Module[{n = Max@Cases[g, _Integer, ∞]},
  Graphics[{
    Line[{{0, 0}, {n+1, 0}}],
    List@@g /. (ah_)_{i,j} => {
      Arrow[BezierCurve[{{i, 0}, {i+j, Abs[j-i]}/2,
        {j, 0}}]],
      Text[ah /. {Ap->"+", Am->"-"}, {i, 0.3}],
      Table[Text[i, {i, -0.5}], {i, n}]}]}]
```

```
Draw /@ GD /@ AllKnots@{3, 5}
KnotTheory::loading: Loading precomputed data in PD4Knots`.
```



```
GD /@ AllKnots@{3, 5}
{GD[Am_{4,1}, Am_{6,3}, Am_{2,5}], GD[Ap_{1,4}, Ap_{5,8}, Am_{3,6}, Am_{7,2}],
GD[Am_{6,1}, Am_{8,3}, Am_{10,5}, Am_{2,7}, Am_{4,9}],
GD[Am_{4,1}, Am_{8,3}, Am_{10,5}, Am_{6,9}, Am_{2,7}]}
```

```
CF[g_GD] := Sort[
  g /. Thread[Sort@Cases[g, _Integer, ∞] ->
    Range[2 Length[g]]];
PV[F_GD, g_GD] /; Length[F] > Length[g] := 0;
PV[F_GD, g_GD] /; Length[F] < Length[g] := Sum[
  PV[F, y], {y, Subsets[g, {Length[F]}]}];
PV[F_GD, g_GD] /; Length[F] == Length[g] := If[
  CF[F] == CF[g /. Ap | Am -> A], (-1)^Count[g, Am_], 0];
V2[g_] := V2[g] = PV[GD[A_{3,1}, A_{2,4}], GD[g]];
```

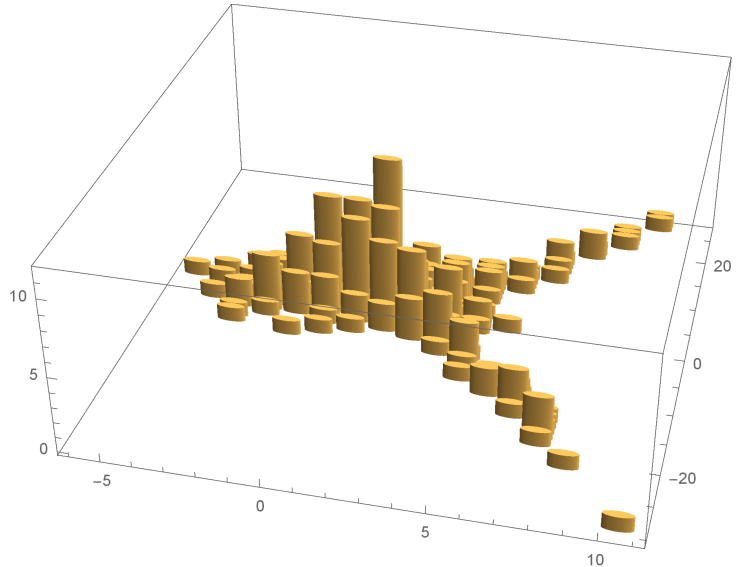
```
Format[Knot[n_, k_]] := nk;
Table[K -> V2[K], {K, AllKnots@{3, 7}}]
{3_1 -> 1, 4_1 -> -1, 5_1 -> 3, 5_2 -> 2, 6_1 -> -2, 6_2 -> -1, 6_3 -> 1,
  7_1 -> 6, 7_2 -> 3, 7_3 -> 5, 7_4 -> 4, 7_5 -> 4, 7_6 -> 1, 7_7 -> -1}
```

```
PV[F1_ + F2_, g_] := PV[F1, g] + PV[F2, g];
PV[c_*F_GD, g_] := c PV[F, g];
ρ_k[g_] := g /. i_Integer -> Mod[i - k, 2 Length@g, 1];
F3 = Sum_{k=0}^5 (3 ρ_k @ GD[A_{1,5}, A_{4,2}, A_{6,3}] + 2 ρ_k @ GD[A_{1,4}, A_{5,2}, A_{3,6}]);
V3[K_] := V3[K] = PV[F3, GD@K] / 6;
```

Loading KnotTheory`

```
Table[K -> V3[K], {K, AllKnots@{3, 7}}]
{3_1 -> -1, 4_1 -> 0, 5_1 -> -5, 5_2 -> -3, 6_1 -> 1, 6_2 -> 1, 6_3 -> 0,
  7_1 -> -14, 7_2 -> -6, 7_3 -> 11, 7_4 -> 8, 7_5 -> -8, 7_6 -> -2, 7_7 -> -1}
```

```
Histogram3D[
  Table[{V2[K], V3[K]}, {K, AllKnots@{3, 10}}],
  {1}]
```



```
G[λ]_{a,b} := ∂_{t_a, h_b} λ;
G /: Factor[G[λ]] :=
  G[Collect[λ, h_, Collect[#, t_, Factor] &]];
Format@γ_G := Module[{S = Union@Cases[γ, (h | t)_a -> a, ∞]},
  Table[γ_{a,b}, {a, S}, {b, S}] // MatrixForm];
```

```
G /: G[λ1] G[λ2] := G[λ1 + λ2];
m_{a,b -> c}[G[λ]] := Module[{α, β, γ, δ, θ, ε, φ, ψ, Ξ, μ},
  (α β θ) = (∂_{t_a, h_a} λ ∂_{t_a, h_b} λ ∂_{t_a} λ)
  (γ δ ε) = (∂_{t_b, h_a} λ ∂_{t_b, h_b} λ ∂_{t_b} λ) / (t | h)_{a|b} -> 0;
  μ = 1 - β;
  G[Tr[(t_c)ᵀ . (γ + α δ / μ ε + δ θ / μ) . (h_c)]] / (t_{a|b} -> t_c //
  Factor];
Rp_{a,b} := G[Tr[(t_a)ᵀ . (1 1 - T_a) . (h_a)]];
Rm_{a,b} := Rp_{a,b} / (T_a -> 1 / T_a);
```

```
GG[g_GD, k_, F_, BB_] :=
  Module[{n = 2 Length@g + Length@BB, y, cuts, rr, γ0, γ},
  γ0 = G[t_{n+1} h_{n+1}] Times@g /. {Ap -> Rp, Am -> Rm};
  γ0 *= G[Sum[β_{a,b} t_a h_b, {a, BB}, {b, BB}]];
  Sum[γ = γ0;
  cuts = Cases[y, _Integer, ∞] ∪ {n+1};
  rr = Thread[cuts -> Range[Length@cuts]];
  Do[If[! MemberQ[cuts, j], γ = γ / m_{j, j+1+j+1}], {j, n}];
  F[y /. rr, γ /. (v_)_a -> v_{a, rr},
  (*over*) {y, Subsets[List@g, k]}];
  GG[g_GD, k_, F_] := GG[g, k, F, {}];
```