

Pensieve Header: A sample Lambda generated using TailScatteringTowardsTheHead.

```
In[1]:= SetDirectory["C:\\drorbn\\AcademicPensieve\\2010-09"];  
<< KnotTheory`  
<< TailScatteringTowardsTheHead-Program.m
```

Loading KnotTheory` version of August 22, 2010, 13:36:57.55.
Read more at <http://katlas.org/wiki/KnotTheory>.

```
In[4]:= GD[Knot[10, 165]]
```

KnotTheory:loading : Loading precomputed data in PD4Knots`.

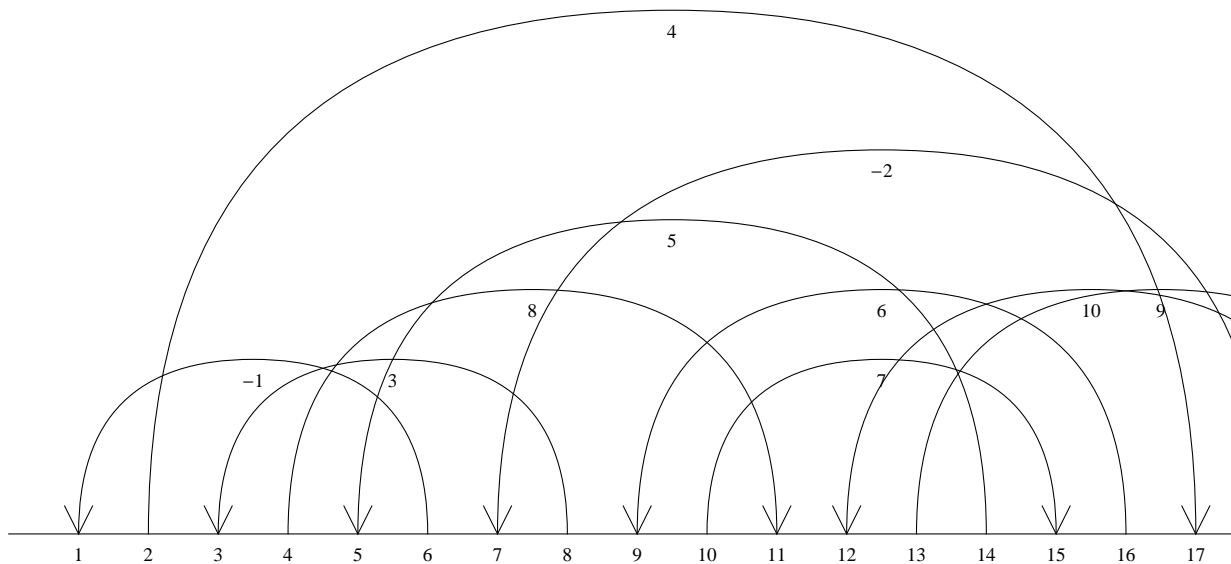
```
Out[4]= GD[Ar[6, 1, -1], Ar[18, 7, -1], Ar[8, 3, 1], Ar[2, 17, 1], Ar[14, 5, 1],  
Ar[16, 9, 1], Ar[10, 15, 1], Ar[4, 11, 1], Ar[13, 20, 1], Ar[19, 12, 1]]
```

```
In[5]:= gd = GD[Ar[3, 1, +1], Ar[2, 5, -1], Ar[6, 4, +1]];  
gd = GD[Ar[4, 1, +1], Ar[7, 2, -1], Ar[3, 6, +1], Ar[8, 5, +1]];  
gd = GD[Ar[6, 1, -1], Ar[18, 7, -1], Ar[8, 3, 1], Ar[2, 17, 1], Ar[14, 5, 1],  
Ar[16, 9, 1], Ar[10, 15, 1], Ar[4, 11, 1], Ar[13, 20, 1], Ar[19, 12, 1]];  
{  
gd,  
n = Length[gd]  
}
```

```
Out[8]= {GD[Ar[6, 1, -1], Ar[18, 7, -1], Ar[8, 3, 1], Ar[2, 17, 1], Ar[14, 5, 1],  
Ar[16, 9, 1], Ar[10, 15, 1], Ar[4, 11, 1], Ar[13, 20, 1], Ar[19, 12, 1]], 10}
```

```
In[9]:= Draw[gd]
```

Out[9]=



In[10]:= R[gd] // MatrixForm

Out[10]//MatrixForm=

$$\begin{pmatrix} -1 & \frac{1}{x} & 0 & 1 - \frac{1}{x} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & \frac{1}{x} & 0 & 0 & 0 & 0 & 1 - \frac{1}{x} & 0 \\ 0 & -1 & X & 0 & 1 - X & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 - X & 0 & 0 & 0 & 0 & 0 & 0 & -1 & X & 0 \\ 0 & 0 & -1 & X & 0 & 0 & 0 & 1 - X & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & X & 0 & 0 & 1 - X & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 - X & 0 & -1 & X & 0 & 0 \\ 0 & 0 & 1 - X & 0 & 0 & -1 & X & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 - X & 0 & -1 & X \\ 0 & 0 & 0 & 0 & 0 & 0 & -1 & X & 0 & 1 - X & 0 \end{pmatrix}$$

In[11]:= Lambda[gd_] := Module[{arcs, r, n, j},

```

n = Length[gd];
arcs = Arcs[gd];
r = R[gd];
Table[
  Inverse[Append[r, e[n+1, arcs[[gd[[j, 2]]]]]].Append[x e[n, j], DR],
  {j, n}
] // Transpose // Simplify
]

```

In[16]:= Inverse[Append[R[gd], e[n+1, 1]]] // Simplify // MatrixForm

Out[16]//MatrixForm=

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & \frac{(-1+X)^2 (5-8 X+5 X^2)}{2-10 X+15 X^2-10 X^3+2 X^4} & \frac{3-14 X+24 X^2-19 X^3+6 X^4}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & -\frac{(-1+X)^3 (3-4 X+2 X^2)}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{2-7 X+7 X^2+X^3-6 X^4+3 X^5}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & -\frac{(-1+X)}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} \\ 1 & \frac{5-17 X+25 X^2-20 X^3+9 X^4-2 X^5}{2-10 X+15 X^2-10 X^3+2 X^4} & \frac{3-13 X+21 X^2-18 X^3+8 X^4-2 X^5}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{(-1+X)^2 (3-6 X+4 X^2)}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & -\frac{(-1+X)^3 (2-X-X^2+2 X^3)}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & -\frac{(-1+X)}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} \\ 1 & \frac{5-13 X+13 X^2-5 X^3}{2-10 X+15 X^2-10 X^3+2 X^4} & \frac{3-11 X+13 X^2-6 X^3}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{(-1+X)^2 (3-4 X+2 X^2)}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{2-5 X+2 X^2+3 X^3-3 X^4}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{3-9 X}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} \\ 1 & \frac{5-18 X+25 X^2-18 X^3+7 X^4-2 X^5}{2-10 X+15 X^2-10 X^3+2 X^4} & \frac{3-14 X+25 X^2-25 X^3+14 X^4-4 X^5}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{3-13 X+22 X^2-18 X^3+6 X^4}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{2-7 X+7 X^2-6 X^4+5 X^5-2 X^6}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & -\frac{(-1+X)}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} \\ 1 & \frac{5-17 X+22 X^2-14 X^3+4 X^4-X^5}{2-10 X+15 X^2-10 X^3+2 X^4} & \frac{3-13 X+20 X^2-16 X^3+7 X^4-2 X^5}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{3-12 X+18 X^2-13 X^3+4 X^4}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & -\frac{-2+7 X-8 X^2+3 X^3+2 X^4-2 X^5+X^6}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{3-11 X+16 X}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} \\ 1 & \frac{5-20 X+31 X^2-25 X^3+10 X^4-2 X^5}{2-10 X+15 X^2-10 X^3+2 X^4} & \frac{3-14 X+23 X^2-19 X^3+8 X^4-2 X^5}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{3-13 X+20 X^2-14 X^3+4 X^4}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{2-7 X+5 X^2+6 X^3-13 X^4+8 X^5-2 X^6}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{3-12 X+16 X}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} \\ 1 & \frac{5-17 X+21 X^2-12 X^3+2 X^4}{2-10 X+15 X^2-10 X^3+2 X^4} & \frac{3-13 X+19 X^2-12 X^3+2 X^4}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{(-1+X)^2 (3-6 X+2 X^2)}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{2-7 X+8 X^2-4 X^3}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{3-11 X+16 X}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} \\ 1 & \frac{5-18 X+24 X^2-16 X^3+5 X^4-X^5}{2-10 X+15 X^2-10 X^3+2 X^4} & \frac{3-14 X+24 X^2-21 X^3+9 X^4-2 X^5}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{(-1+X)^3 (-3+4 X)}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{-2+7 X-7 X^2+X^3+4 X^4-3 X^5+X^6}{X^2 (-2+10 X-15 X^2+10 X^3-2 X^4)} & \frac{3-12 X+20 X^2}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} \\ 1 & \frac{5-20 X+28 X^2-18 X^3+4 X^4}{2-10 X+15 X^2-10 X^3+2 X^4} & \frac{3-14 X+22 X^2-16 X^3+4 X^4}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{3-13 X+19 X^2-12 X^3+2 X^4}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{2-7 X+5 X^2+3 X^3-6 X^4+2 X^5}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} & \frac{3-12 X+16 X}{X^2 (2-10 X+15 X^2-10 X^3+2 X^4)} \\ 1 & 1 & \frac{1}{X^2} & \frac{1}{X^2} & \frac{1}{X^2} & \frac{1}{X^2} \end{pmatrix}$$

In[12]:= **Lambda[gd] // MatrixForm**

Out[12]//MatrixForm=

$\text{DR} + \frac{x(-5+13x-13x^2+5x^3)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(3-14x+24x^2-19x^3+6x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x(-1+x)^3(-3+4x)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(-1+x)^3(2-x)}{x^2(2-10x+15x^2-10x^3+2x^4)}$
$\text{DR} + \frac{x x(-5+13x-13x^2+5x^3)}{2-10x+15x^2-10x^3+2x^4}$	DR	$\text{DR} - \frac{2x(-1+x)^3}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(-1+x+2x^2-4)}{2-10x+15x^2-10x^3+2x^4}$
$\text{DR} - \frac{x x(4-12x+15x^2-9x^3+2x^4)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(1-3x+x^2+2x^3-2x^4)}{x(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(-1+x)^2}{x(2-10x+15x^2-10x^3+2x^4)}$	DR
DR	$\text{DR} - \frac{x(-3+11x-13x^2+6x^3)}{x(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x(-1+x)^2(-3+2x)}{x(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(2-6x+3x^2+5x^3)}{x(2-10x+15x^2-10x^3+2x^4)}$
$\text{DR} - \frac{x x(5-12x+13x^2-7x^3+2x^4)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(1-6x+8x^2-4x^3)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(1-3x+2x^2)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(1-2x^2+2x^3)}{2-10x+15x^2-10x^3+2x^4}$
$\text{DR} - \frac{x x(4-9x+9x^2-4x^3+4x^4)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(1-4x+3x^2+x^3-2x^4)}{x(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(1-3x+2x^2)}{x(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x x(-3+6x-5)}{2-10x+15x^2-10x^3+2x^4}$
$\text{DR} - \frac{x x(7-18x+20x^2-10x^3+2x^4)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(1-2x^2+2x^3)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(-1+x)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(-3+6x-5)}{2-10x+15x^2-10x^3+2x^4}$
$\text{DR} + \frac{x x(-4+8x-7x^2+2x^3)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(1-5x+7x^2-4x^3)}{x(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x(-1+x)^2(-1+2x)}{x(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x x(-4+8x-7)}{2-10x+15x^2-10x^3+2x^4}$
$\text{DR} - \frac{x x(5-11x+11x^2-5x^3+4x^4)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x x(2-3x+2x^2)}{2-10x+15x^2-10x^3+2x^4}$	DR	$\text{DR} + \frac{x(-1-x+4x^2-4)}{2-10x+15x^2-10x^3+2x^4}$
$\text{DR} + \frac{x x(-7+15x-13x^2+4x^3)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(2-3x+2x^2)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(2-3x+2x^2)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(-3+3x+2x^2-1)}{2-10x+15x^2-10x^3+2x^4}$
$\text{DR} + \frac{x(-3+3x+2x^2-5x^3+2x^4)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(1-4x+9x^2-9x^3+4x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x(1-3x+6x^2-5x^3+2x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(-3+7x-10x^2+10)}{x(2-10x+15x^2-10x^3+2x^4)}$

In[18]:= **Inverse[Append[R[gd], e[n+1, 1]].Append[x IdentityMatrix[n], Table[DR, {n}]] // Simplify // MatrixForm**

Out[18]//MatrixForm=

$\text{DR} + \frac{x(-1+x)^2(5-8x+5x^2)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(3-14x+24x^2-19x^3+6x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x(-1+x)^3(3-4x+2x^2)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x}{x^2}$
$\text{DR} - \frac{x(-5+17x-25x^2+20x^3-9x^4+2x^5)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(-3+13x-21x^2+18x^3-8x^4+2x^5)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(-1+x)^2(3-6x+4x^2)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x}{x^2}$
$\text{DR} - \frac{x(-5+13x-13x^2+5x^3)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(-3+11x-13x^2+6x^3)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(-1+x)^2(3-4x+2x^2)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x}{x^2}$
$\text{DR} - \frac{x(-5+18x-25x^2+18x^3-7x^4+2x^5)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(-3+14x-25x^2+25x^3-14x^4+4x^5)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(3-13x+22x^2-18x^3+6x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x(-2+7x-10x^2+10)}{x^2(2-10x+15x^2-10x^3+2x^4)}$
$\text{DR} - \frac{x(-5+17x-22x^2+14x^3-4x^4+x^5)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(-3+13x-20x^2+16x^3-7x^4+2x^5)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(3-12x+18x^2-13x^3+4x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x(-2+7x-10x^2+10)}{x^2(2-10x+15x^2-10x^3+2x^4)}$
$\text{DR} - \frac{x(-5+20x-31x^2+25x^3-10x^4+2x^5)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(-3+14x-23x^2+19x^3-8x^4+2x^5)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(3-13x+20x^2-14x^3+4x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x(-2+7x-10x^2+10)}{x^2(2-10x+15x^2-10x^3+2x^4)}$
$\text{DR} + \frac{x(5-17x+21x^2-12x^3+2x^4)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(3-13x+19x^2-12x^3+2x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(-1+x)^2(3-6x+2x^2)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x}{x^2}$
$\text{DR} - \frac{x(-5+18x-24x^2+16x^3-5x^4+x^5)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} - \frac{x(-3+14x-24x^2+21x^3-9x^4+2x^5)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(-1+x)^3(-3+4x)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} - \frac{x(-2+7x-10x^2+10)}{x^2(2-10x+15x^2-10x^3+2x^4)}$
$\text{DR} + \frac{x(5-20x+28x^2-18x^3+4x^4)}{2-10x+15x^2-10x^3+2x^4}$	$\text{DR} + \frac{x(3-14x+22x^2-16x^3+4x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x(3-13x+19x^2-12x^3+2x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)}$	$\text{DR} + \frac{x}{x^2}$
$\text{DR} + \frac{x}{x^2}$	$\text{DR} + \frac{x}{x^2}$	$\text{DR} + \frac{x}{x^2}$	$\text{DR} + \frac{x}{x^2}$

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In[21]:= Append[R[gd], e[n+1, n+1]].Lambda[gd] // Simplify // MatrixForm
```

Out[21]/MatrixForm=

$$\begin{pmatrix}
 x & 0 & 0 & 0 & 0 \\
 0 & x & 0 & 0 & 0 \\
 0 & 0 & x & 0 & 0 \\
 0 & 0 & 0 & x & 0 \\
 0 & 0 & 0 & 0 & x \\
 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0
 \end{pmatrix}
 \begin{matrix}
 DR + x & DR + \frac{x(-3+3x+2x^2-5x^3+2x^4)}{2-10x+15x^2-10x^3+2x^4} & DR - \frac{x(1-4x+9x^2-9x^3+4x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)} & DR - \frac{x(1-3x+6x^2-5x^3+2x^4)}{x^2(2-10x+15x^2-10x^3+2x^4)} & DR + \frac{x(-3+7x-10x^2+10x^3-7x^4)}{x(2-10x+15x^2-10x^3+2x^4)}
 \end{matrix}$$