

Pensieve Header: An attempt on the ribbon property using Γ -calculus.

```
dir = SetDirectory["C:/drorbn/AcademicPensieve/2014-05/"];
```

```
<< KnotTheory`
```

```
<< MetaCalculi/MetaCalculi-Program.m
```

Loading KnotTheory` version of April 3, 2014, 16:23:56.0784.

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

$$n = 4; \gamma = \Gamma \left[\omega 1, \sum_{a=0}^n h_a \sigma_a, \sum_{a=1}^n \sum_{b=1}^n t_a h_b \alpha_{10 a+b} \right]$$

$$\begin{pmatrix} \omega 1 & s_1 & s_2 & s_3 & s_4 \\ s_1 & \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} \\ s_2 & \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24} \\ s_3 & \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} \\ s_4 & \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} \\ \Sigma & \sigma_1 & \sigma_2 & \sigma_3 & \sigma_4 \end{pmatrix}$$

```
 $\epsilon[1] \epsilon[2] // \Gamma$ 
```

$$\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Sigma & 1 & 1 \end{pmatrix}$$

```
cert =  $\gamma // \text{dm}[1, 2, 1] // \text{dm}[3, 4, 2]$ 
```

$$\begin{pmatrix} \omega 1 (1 - \alpha_{12} - \alpha_{14} \alpha_{32} - \alpha_{34} + \alpha_{12} \alpha_{34}) & S_1 \\ S_1 & \frac{\alpha_{21} - \alpha_{12} \alpha_{21} + \alpha_{11} \alpha_{22} + \alpha_{14} \alpha_{22} \alpha_{31} + \alpha_{24} \alpha_{31} - \alpha_{12} \alpha_{24} \alpha_{31} - \alpha_{14} \alpha_{21} \alpha_{32} + \alpha_{11} \alpha_{24} \alpha_{32} - \alpha_{21} \alpha_{34} + \alpha_{12} \alpha_{21} \alpha_3}{1 - \alpha_{12} - \alpha_{14} \alpha_{32} - \alpha_{34} + \alpha_{12} \alpha_{34}} \\ S_2 & \frac{\alpha_{41} - \alpha_{12} \alpha_{41} - \alpha_{14} \alpha_{32} \alpha_{41} - \alpha_{34} \alpha_{41} + \alpha_{12} \alpha_{34} \alpha_{41} + \alpha_{11} \alpha_{42} + \alpha_{14} \alpha_{31} \alpha_{42} - \alpha_{11} \alpha_{34} \alpha_{42} + \alpha_{31} \alpha_{44} - \alpha_{12} \alpha_{31} \alpha_4}{1 - \alpha_{12} - \alpha_{14} \alpha_{32} - \alpha_{34} + \alpha_{12} \alpha_{34}} \\ \Sigma & \sigma_1 \sigma_2 \end{pmatrix}$$

```
eqns = ( $\epsilon[1] \epsilon[2] // \Gamma$ ) == (cert /.  $\sigma_ \rightarrow 1$ ) // Simplify
```

$$\begin{aligned} 1 + \omega 1 \alpha_{14} \alpha_{32} + \omega 1 \alpha_{34} + \alpha_{12} (\omega 1 - \omega 1 \alpha_{34}) & == \omega 1 \&\& \\ (- (\alpha_{14} \alpha_{22} - (-1 + \alpha_{12}) \alpha_{24}) \alpha_{31} + \alpha_{11} (-\alpha_{24} \alpha_{32} + \alpha_{22} (-1 + \alpha_{34})) + & \\ \alpha_{21} (-1 + \alpha_{14} \alpha_{32} - \alpha_{12} (-1 + \alpha_{34}) + \alpha_{34})) / (-1 + \alpha_{14} \alpha_{32} - \alpha_{12} (-1 + \alpha_{34}) + \alpha_{34}) & == 1 \&\& \\ (- (\alpha_{14} \alpha_{22} - (-1 + \alpha_{12}) \alpha_{24}) \alpha_{33} + \alpha_{13} (-\alpha_{24} \alpha_{32} + \alpha_{22} (-1 + \alpha_{34})) + & \\ \alpha_{23} (-1 + \alpha_{14} \alpha_{32} - \alpha_{12} (-1 + \alpha_{34}) + \alpha_{34})) / (-1 + \alpha_{14} \alpha_{32} - \alpha_{12} (-1 + \alpha_{34}) + \alpha_{34}) & == 0 \&\& \\ ((-1 + \alpha_{14} \alpha_{32} - \alpha_{12} (-1 + \alpha_{34}) + \alpha_{34}) \alpha_{41} - \alpha_{31} (\alpha_{14} \alpha_{42} - (-1 + \alpha_{12}) \alpha_{44}) + & \\ \alpha_{11} ((-1 + \alpha_{34}) \alpha_{42} - \alpha_{32} \alpha_{44})) / (-1 + \alpha_{14} \alpha_{32} - \alpha_{12} (-1 + \alpha_{34}) + \alpha_{34}) & == 0 \&\& \\ (\alpha_{14} (\alpha_{33} \alpha_{42} - \alpha_{32} \alpha_{43}) + \alpha_{13} (-(-1 + \alpha_{34}) \alpha_{42} + \alpha_{32} \alpha_{44}) + (-1 + \alpha_{12}) ((-1 + \alpha_{34}) \alpha_{43} - \alpha_{33} \alpha_{44})) / & \\ (1 - \alpha_{14} \alpha_{32} + \alpha_{12} (-1 + \alpha_{34}) - \alpha_{34}) & == 1 \end{aligned}$$

```
alex = ( $\gamma // \text{dm}[4, 3, 3] // \text{dm}[3, 2, 2] // \text{dm}[2, 1, 1]$ ) [[1]]
```

$$-\omega 1 (-1 + \alpha_{21} + \alpha_{22} \alpha_{31} + \alpha_{32} - \alpha_{21} \alpha_{32} + \alpha_{23} \alpha_{41} - \alpha_{23} \alpha_{32} \alpha_{41} + \alpha_{22} \alpha_{33} \alpha_{41} + \alpha_{23} \alpha_{31} \alpha_{42} + \alpha_{33} \alpha_{42} - \alpha_{21} \alpha_{33} \alpha_{42} + \alpha_{43} - \alpha_{21} \alpha_{43} - \alpha_{22} \alpha_{31} \alpha_{43} - \alpha_{32} \alpha_{43} + \alpha_{21} \alpha_{32} \alpha_{43})$$

```
Simplify[alex, eqns]
```

$$\omega 1 (1 - \alpha_{23} \alpha_{41} + \alpha_{21} (-1 + \alpha_{43}) - \alpha_{43})$$

```
Simplify[cert[[1]]]
```

$$\omega 1 (1 - \alpha_{14} \alpha_{32} + \alpha_{12} (-1 + \alpha_{34}) - \alpha_{34})$$