

Pensieve header: NOE-1 demo for GWU-1612, using elf conventions.

```
SetDirectory["C:\\drorbn\\AcademicPensieve\\Talks\\GWU-1612"];
```

## Formatting

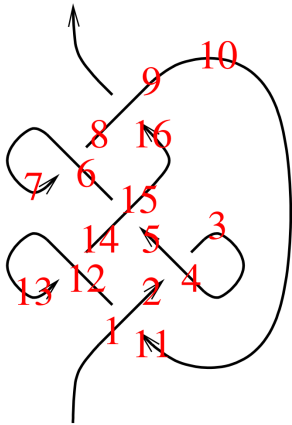
CF

```
CF[ $\mathcal{E}$ _] := Module[{vars = Union@Cases[ $\mathcal{E}$ , e_ | l_ | f_,  $\infty$ ]},
  If[vars == {}, Factor[ $\mathcal{E}$ ],
    Total[CoefficientRules[ $\mathcal{E}$ , vars] /. (p_ -> c_) => Factor[c] Times @@ (vars^p)]];
CF[ $\mathcal{E}$ _E] := CF /@  $\mathcal{E}$ ;
```

## The Program and the Trefoil

Preparation

```
E[i_, j_, s_] := E[1, (-1)^s l_j, (-t)^s e_i f_j, t^s e_i l_{(1+s) i-s j} f_j + (-1)^s l_i l_j + (-t^2)^s e_i^2 f_j^2 / 4];
E[i_, s_] := E[1, 0, 0, s l_i];
E /: E[1, L1_, Q1_, P1_] E[1, L2_, Q2_, P2_] := E[1, L1 + L2, Q1 + Q2, P1 + P2];
```



Prep31

```
z1 = (E[1, 11, 0] E[4, 2, -1] E[15, 5, 0] ×
  E[6, 8, -1] E[9, 16, 0] E[12, 14, -1] E[3, -1] E[7, +1] E[10, -1] E[13, +1])
```

Prep31

$$E\left[1, -l_2 + l_5 - l_8 + l_{11} - l_{14} + l_{16}, -\frac{e_4 f_2}{t} + e_{15} f_5 - \frac{e_6 f_8}{t} + e_1 f_{11} - \frac{e_{12} f_{14}}{t} + e_9 f_{16},\right. \\ \left. -\frac{e_2^2 f_2^2}{4 t^2} + \frac{1}{4} e_{15}^2 f_5^2 - \frac{e_6^2 f_8^2}{4 t^2} + \frac{1}{4} e_1^2 f_{11}^2 - \frac{e_{12}^2 f_{14}^2}{4 t^2} + \frac{1}{4} e_9^2 f_{16}^2 + e_1 f_{11} l_1 + \frac{e_4 f_2 l_2}{t} - l_3 - l_2 l_4 + l_7 + \right. \\ \left. \frac{e_6 f_8 l_8}{t} - l_6 l_8 + e_9 f_{16} l_9 - l_{10} + l_1 l_{11} + l_{13} + \frac{e_{12} f_{14} l_{14}}{t} - l_{12} l_{14} + e_{15} f_5 l_{15} + l_5 l_{15} + l_9 l_{16}\right]$$

DP

```
DP_{x_→D_α, y_→D_β}[P_] [f_] :=
  Total[CoefficientRules[P, {x, y}] /. ({m_, n_} -> c_) => c D[f, {α, m}, {β, n}]]
```

Six

```
S_{l_j} (x:e|f)_{i_→k_}[E[ω_, L_, Q_, P_]] := With[{λ = ∂_{l_j} L, α = ∂_{x_i} Q, q = e^y β x_k + γ l_k}, CF [
  E[ω, L /. l_j -> l_k, t^λ α x_k + (Q /. x_i -> 0), e^{-q} DP_{l_j→D_γ, x_i→D_β}[P][e^q] /. {β -> α / ω, γ -> λ Log[t}]]];
```

Logos

$$\Delta[k_-] := \left( (t-1) (2(\alpha\beta + \delta\mu)^2 - \alpha^2\beta^2) - 4e_k l_k f_k \delta^2 \mu^2 - \delta(1+\mu)(f_k^2 \alpha^2 + e_k^2 \beta^2) - e_k^2 f_k^2 \delta^3 (1+3\mu) - 2(\alpha\beta + 2\delta\mu + e_k f_k \delta^2 (1+2\mu) + 2l_k \delta \mu^2)(f_k \alpha + e_k \beta) - 4(l_k \mu^2 + e_k f_k \delta(1+\mu))(\alpha\beta + \delta\mu) \right) / 4;$$

Sfe

$$S_{f_i e_j \rightarrow k_-}[\mathbb{E}[\omega_-, L_-, Q_-, P_-]] := \text{With}\left[\left\{q = \left(\frac{(1-t)\alpha\beta + \beta e_k + \alpha f_k + \delta e_k f_k}{\mu}\right), \text{CF}\left[\mathbb{E}\left[\mu \omega, L, \mu \omega q + \mu(Q / f_i | e_j \rightarrow \theta), \mu^4 e^{-q} \text{DP}_{f_i \rightarrow D_\alpha, e_j \rightarrow D_\beta}[P][e^q] + \omega^4 \Delta[k_-]\right] / \mu \rightarrow 1 + (t-1)\delta / \left\{\alpha \rightarrow \omega^{-1}(\partial_{f_i} Q / e_j \rightarrow \theta), \beta \rightarrow \omega^{-1}(\partial_{e_j} Q / f_i \rightarrow \theta), \delta \rightarrow \omega^{-1} \partial_{f_i, e_j} Q\right\}\right]\right\};$$

m

$$m_{i, j \rightarrow k_-}[Z_E] := \text{Module}\left[\{x, z\}, \text{CF}\left[\left(Z // S_{f_i e_j \rightarrow x} // S_{l_i e_x \rightarrow x} // S_{f_x l_j \rightarrow x}\right) / \cdot Z_{-i|j|x} \rightarrow Z_k\right]\right]$$

E31

$$\left(\text{Do}[z1 = z1 // m_{1, k \rightarrow 1}, \{k, 2, 16\}]; z1\right)$$

E31

$$\mathbb{E}\left[\frac{1-t+t^2}{t}, \theta, \theta, \frac{(-1+t)(1-t+t^2)^2(1-t+2t^2)}{t^3} - \frac{2(1+t)(1-t+t^2)^3 e_1 f_1}{t^4} - \frac{2(-1+t)(1+t)(1-t+t^2)^3 l_1}{t^4}\right]$$

rho1

$$\rho_1[\mathbb{E}[\omega_-, \_, \_, P_-]] := \text{CF}\left[\frac{t\left(\left(P / e_- | l_- | f_- \rightarrow \theta\right) - t \omega^3 (\partial_t \omega)\right)}{(t-1)^2 \omega^2}\right]$$

rho131

$$\rho_1[z1] // \text{Expand}$$

rho131

$$\frac{1}{t} + t$$

## Exporting the above as PDF files

The below is adapted from pensieve://Talks/NCSU-1604/GaussGassnerDemo.nb.

```
ConditionalExport[fname_String, rest___] := Module[{temp, exists},
  temp = "ConditionalExportTemporary" <> "." <> FileExtension[fname];
  exists = FileExistsQ[fname];
  Export[temp, rest];
  If[exists && FileByteCount[fname] === FileByteCount[temp],
    DeleteFile[temp],
    (* else *) Print["Exporting " <> fname <> "..."];
    If[exists, DeleteFile[fname]];
    RenameFile[temp, fname]
  ];
  fname
]

SetOptions[$FrontEndSession, PrintingStyleEnvironment -> "Working"];
TagProperties[_] := {};
TagProperties["131"] = {PageWidth -> 3.2/0.66};
Options[CellExport] = {
  PageWidth -> 4/0.66, CellFilter -> Identity, ExportDirectory -> "Snips",
  ExportBaseFilename -> Automatic, ExportFormat -> ".pdf", ExportOptions -> {}, Split -> False
};
CellExport[tag_String, opts___Rule] := CellExport[
```

```

NotebookGet[EvaluationNotebook[]],
tag, opts
];
CellExport[nb_Notebook, tag_String] := CellExport[nb, tag, TagProperties[tag]];
CellExport[nb_Notebook, tag_String, OptionsPattern[]] := Module[
{cells, cell, filename, format},
filename = FileNameJoin[{
OptionValue[ExportDirectory] /. Automatic -> Directory[],
OptionValue[ExportBaseFilename] /. Automatic -> tag
}];
format = OptionValue[ExportFormat];
cells = OptionValue[CellFilter][Cases[
nb, c_Cell /; FreeQ[List@@c, Cell] && !FreeQ[c, CellTags -> tag],
Infinity
]];
If[!OptionValue[Split],
If[Length[cells] ≥ 1,
If[Length[cells] == 1,
cells = Join[First[cells],
Cell[PageWidth -> 1.2 × 72 OptionValue[PageWidth], Background -> {White, Opacity[0]}]],
cells = Cell[CellGroup[cells], PageWidth -> 72 OptionValue[PageWidth]
];
ConditionalExport[
filename <> format, cells,
ImageResolution -> 300,
OptionValue[ExportOptions]
]
],
k = 0;
Table[
++k;
ConditionalExport[
filename <> "-" <> ToString[k] <> format,
Append[cell, PageWidth -> 72 OptionValue[PageWidth]],
ImageResolution -> 300,
OptionValue[ExportOptions]
],
{cell, cells}
]
];

ExportCells := (
nb = NotebookGet[EvaluationNotebook[]];
tags = Cases[nb, (CellTags -> tag_String) => tag, Infinity] // Union;
Print[tags];
CellExport /@ tags;
Print["Done."]
);

```

### ExportCells

```
{CF, DP, E31, Logos, m, Prep31, Preparation, rho1, rho131, Sfe, Slx}
```

Exporting Snips\E31.pdf...

Exporting Snips\Prep31.pdf...

Exporting Snips\rho131.pdf...

Done.