

```

Logm[ $\mathcal{E} : \mathbb{E}_{is \rightarrow \{i\}}[\_]$ ] :=
Module[{e, k, n, G, c, g, eqn, Sanify, MI
(*multi-index*), mis, mi, yax, p, q},
G =  $\mathbb{U}_{is \rightarrow \{i\}} [c_1 a_i + c_2 x_i y_i]$ ;
eqn = U21[Last[Expm[G]] -  $\mathcal{E}[[1]]$ ];
{eqn, G} =
CF /@
({eqn, G} /.
First@Solve[Coefficient[eqn, ai] == 0, c1]);
Sanify[{{v- → s-}}] :=
v → PowerExpand[Normal[s] /. c- → 0];
G =
CF[
G /. Sanify@Solve[Coefficient[eqn, xi yi] == 0,
c2]];
G[[1]] += c0 + c1 xi + c2 yi;
eqn = U21[Last[Expm[G]] -  $\mathcal{E}[[1]]$ ];
{eqn, G} =
CF /@
({eqn, G} /.
First@Solve[Coefficient[eqn, xi] == 0 ∧
Coefficient[eqn, yi] == 0, {c1, c2}]};
G = G /. First@Solve[eqn == 0, c0];
MI /: Coefficient[e-, MI[p-, n-, q-]] :=
Coefficient[Coefficient[Coefficient[e, yi, p],
ai, n], xi, q];
yax /: yaxMI[p-, n-, q-] := yip ain xiq;
Do[
mis = Flatten@Table[MI[p, n, q], {n, 0, k + 1},
{p, 0, Min[k + 1, 2 k + 2 - 2 n]},
{q, 0, Min[k + 1, 2 k + 2 - 2 n - p]}];
AppendTo[G, Sum[gmi yaxmi, {mi, mis}]];
eqn = U21[Last[Expm[G]] -  $\mathcal{E}[[k + 1]]$ ];
G =
CF[
G /.
First@Solve[Table[Coefficient[eqn, mi] == 0,
{mi, mis}], Table[gmi, {mi, mis}]]],
{k, Length[ $\mathcal{E}$ ] - 1}];
CF[12U@G]
]

```