

Pensieve header: The linearized KV and twist equations.

```
SetDirectory["C:/drorbn/AcademicPensieve/Projects/WKO4"];
<< FreeLie.m;
{A1 = LS[{x, y}, A1s], B1 = LS[{x, y}, B1s]};
msgsl = SeriesSolve[{A1, B1},
   $\hbar^{-1} (b[LW@x, A1] + b[LW@y, B1] \equiv LS[0]) \wedge$ 
   $(\text{div}_x[A1] + \text{div}_y[B1] \equiv CWS[0]) \wedge (A1 \equiv (B1 // \text{LieMorphism}[x \rightarrow y, y \rightarrow x]))];$ 
Do[A1[k]; Print[{k, msgsl // Read // Last // Last // Length,
  TimeUsed[], MaxMemoryUsed[]}], {k, 16}]
A1@16; Length[Last[#]] & /@ Read[msgsl]

FreeLie` implements / extends
{*, +, **, $SeriesShowDegree, <>,  $\int$ ,  $\equiv$ , ad, Ad, adSeries, AllCyclicWords, AllLyndonWords,
  AllWords, Arbitrator, ASeries, AW, b, BCH, BooleanSequence, BracketForm, BS, CC, Crop,
  CW, CWS, CWSeries, D, Deg, DegreeScale, DerivationSeries, div, DK, DKS, EulerE, Exp,
  Inverse, j, J, JA, LieDerivation, LieMorphism, LieSeries, LS, LW, LyndonFactorization,
  Morphism, New, RandomCWSeries, Randomizer, RandomLieSeries, RC, SeriesSolve,
  Support, t, tb, TopBracketForm, tr, UndeterminedCoefficients,  $\Gamma$ ,  $\iota$ ,  $\Lambda$ ,  $\sigma$ ,  $\hbar$ ,  $\neg$ ,  $\sim$ }.
```

FreeLie` is in the public domain. Dror Bar-Natan
is committed to support it within reason until July 15, 2022.

SeriesSolve::ArbitrarilySetting: In degree 1 arbitrarily setting {A1s[y] \rightarrow 0}.

```
{1, 1, 0.452, 29 597 376}
{2, 0, 0.452, 29 597 376}
{3, 0, 0.452, 29 597 376}
{4, 0, 0.468, 29 597 376}
{5, 0, 0.483, 29 597 376}
{6, 0, 0.515, 29 597 376}
{7, 0, 0.577, 29 597 376}
```

SeriesSolve::ArbitrarilySetting: In degree 8 arbitrarily setting {A1s[x, x, x, x, y, x, y] \rightarrow 0}.

```
{8, 1, 0.889, 30 925 608}
{9, 0, 1.529, 36 930 256}
```

SeriesSolve::ArbitrarilySetting: In degree 10 arbitrarily setting {A1s[x, x, x, x, x, x, y, x, y] \rightarrow 0}.

General::stop: Further output of SeriesSolve::ArbitrarilySetting will be suppressed during this calculation. >>

```
{10, 1, 3.65, 49 627 776}
{11, 1, 11.747, 92 393 872}
{12, 2, 49.608, 217 317 952}
{13, 2, 296.09, 638 840 416}
{14, 3, 1618.34, 2 031 775 696}
{15, 3, 8650.46, 7 141 553 512}
```

No more memory available.
Mathematica kernel has shut down.
Try quitting other applications and then retry.

```
SetDirectory["C:/drorbn/AcademicPensieve/Projects/WKO4"];
<< FreeLie.m;
{A1 = LS[{x, y}, A1s], B1 = A1 // LieMorphism[x -> y, y -> x]};
msgs1 = SeriesSolve[A1,
   $\hbar^{-1} (b[LW@x, A1] + b[LW@y, B1] \equiv LS[0]) \wedge (\text{div}_x[A1] + \text{div}_y[B1] \equiv CWS[0])$ ];
Do[A1[k];
  Print[{k, msgs1 // Read // Last // Last // Length, TimeUsed[], MaxMemoryUsed[]}],
  {k, 16}]
A1@16; Length[Last[#]] & /@ Read[msgs1]
```

FreeLie` implements / extends

```
{*, +, **, $SeriesShowDegree, <>, ∫, ≡, ad, Ad, adSeries, AllCyclicWords, AllLyndonWords,
AllWords, Arbitrator, ASeries, AW, b, BCH, BooleanSequence, BracketForm, BS, CC, Crop,
CW, CWS, CWSeries, D, Deg, DegreeScale, DerivationSeries, div, DK, DKS, EulerE, Exp,
Inverse, j, J, JA, LieDerivation, LieMorphism, LieSeries, LS, LW, LyndonFactorization,
Morphism, New, RandomCWSeries, Randomizer, RandomLieSeries, RC, SeriesSolve,
Support, t, tb, TopBracketForm, tr, UndeterminedCoefficients, Γ, ℓ, Δ, σ, ħ, ↦, ↠}.
```

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SeriesSolve::ArbitrarilySetting: In degree 1 arbitrarily setting {A1s[y] → 0}.

```
{1, 1, 0.469, 46 351 216}
{2, 0, 0.469, 46 351 216}
{3, 0, 0.469, 46 351 216}
{4, 0, 0.484, 46 351 216}
{5, 0, 0.484, 46 351 216}
{6, 0, 0.5, 46 351 216}
{7, 0, 0.562, 46 351 216}
```

SeriesSolve::ArbitrarilySetting: In degree 8 arbitrarily setting {A1s[x, x, x, x, y, x, y, y] → 0}.

```
{8, 1, 0.843, 48 798 200}
{9, 0, 1.296, 50 421 456}
```

SeriesSolve::ArbitrarilySetting : In degree 10 arbitrarily setting {A1s[x, x, x, x, x, y, x, y] → 0}.

General::stop : Further output of SeriesSolve::ArbitrarilySetting will be suppressed during this calculation. >>

```
{10, 1, 3.136, 60 453 384}
{11, 1, 10.266, 83 843 784}
{12, 2, 43.229, 152 779 368}
{13, 2, 235.921, 368 534 168}
{14, 3, 1255.15, 1 045 913 112}
{15, 3, 7275.47, 3 924 909 008}
{16, 5, 41 297.9, 16 112 445 728}
{1, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 2, 2, 3, 3, 5}
```