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LieSeries /: Expand[s_LieSeries] := Expand /@ s;
LieSeries /: Plus[ss__LieSeries] /; Length[{ss}] > 1 := Module[
  {l = Min[Length /@ {ss}]},
  LieSeries @@ Total[Take[List @@ #, l] & /@ {ss}]
];
LieSeries /: c_?NumberQ * s_LieSeries := Expand[c * #] & /@ s;
LieSeries /: s_LieSeries + c_.*w_LW /; NumberQ[c] := Module[{d},
  d = Deg[w];
  If[Length[s] < d, 0,
    ReplacePart[s, d -> s[[d]] + Expand[c * w]]
  ]
];
b[w_LW, s_LieSeries] := Join[
  LieSeries @@ Table[0, {Deg[w]}],
  ad[w] /@ s
];
b[s_LieSeries, w_LW] := Expand[-b[w, s]];
ASeries /: Expand[s_ASeries] := Expand /@ s;
ASeries /: Plus[ss__ASeries] := Module[
  {l = Min[Length /@ {ss}]},
  ASeries @@ Total[Take[List @@ #, l] & /@ {ss}]
];
ASeries /: c_ * s_ASeries := Expand[c * #] & /@ s;
s1_ASeries ** s2_ASeries := Module[
  {d, k, m1, m2},
  m1 = LengthWhile[s1, # == 0 &];
  m2 = LengthWhile[s2, # == 0 &];
  ASeries @@ Table[
    Sum[s1[[k + 1]] ** s2[[d - k + 1]], {k, m1, d - m2}],
    {d, 0, Min[m1 + Length[s2] - 1, m2 + Length[s1] - 1]}
  ]
];
ASeries /: EulerE[s_ASeries] :=
  ASeries @@ Expand[Range[{0, 1 + Length[s]}] * (List @@ s)];

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