

```

adPower[0, x_LieSeries][ψ_LieSeries] := adPower[0, x][ψ] = Module[{ser},
  ser = Unique[adPower];
  ser[] = Hold[adPower[0, x][ψ]];
  ser[d_Integer] := ser[d] = ψ[d];
  LieSeries[ser]
];
adPower[n_Integer, x_LieSeries][ψ_LieSeries] := adPower[n, x][ψ] = Module[{ser},
  ser = Unique[adPower];
  ser[] = Hold[adPower[n, x][ψ]];
  ser[d_Integer] := ser[d] = b[x, adPower[n-1, x][ψ]][d];
  LieSeries[ser]
];
adSeries[f_, x_LieSeries][ψ_LieSeries] := adSeries[f, x][ψ] = Module[{ser},
  ser = Unique[adSeries];
  ser[] = Hold[adSeries[f, x][ψ]];
  ser[d_Integer] := ser[d] = Module[{c},
    Expand[Sum[
      c = SeriesCoefficient[f, {ad, 0, k}];
      If[c === 0, 0, c * adPower[k, x][ψ][d]],
      {k, 0, d-1}
    ]]
  ];
  LieSeries[ser]
];
adSeries[f_, x_][ψ_] := adSeries[f, MakeLieSeries[x]][MakeLieSeries[ψ]];
Ad[x_] := adSeries[E^ad, x];

```

? Me

? New

? Object

Information::notfound: Symbol Me not found. >>

Information::notfound: Symbol New not found. >>

Information::notfound: Symbol Object not found. >>

```

adSeries[f_, x_LieSeries][ψ_LieSeries] := adSeries[f, x][ψ] = New[ adSeries[f_, x_I
LieSeries[ser], ser = Unique
ser[d_Integer] := ser[d] = Module[{c}, ser[] = Hold
Expand[Sum[ ser[d_Integer]
c = SeriesCoefficient[f, {ad, 0, k}]; Expand[S
If[c === 0, 0, c * adPower[k, x][ψ][d]], c = Ser
{k, 0, d-1} If[c =
]] {k, 0,
]]
]
]
];
LieSeries[ser]
];

```

```

SetAttributes[New, HoldAll];
New[type_[srn_], def_] := Module[ (* "srn" for "self-reference name" *)
  {un}, (* "un" for "unique name" *)
  un = Unique[ToString[type] <> "$"];
  ReleaseHold[Hold[def] /. srn -> un];
  type[un]
]

New[
  LieSeries[ser],
  ser[d_Integer] := ser[d] = Module[{c},
    Expand[Sum[
      c = SeriesCoefficient[f, {ad, 0, k}];
      If[c === 0, 0, c * adPower[k, x][ψ][d]],
      {k, 0, d - 1}
    ]]
  ]
]
LieSeries[LieSeries$3]

```

?LieSeries\$3

Global`LieSeries\$3

```

LieSeries$3[d_Integer] := LieSeries$3[d] = Module[{c},
  Expand[Sum_{k=0}^{d-1} (c = SeriesCoefficient[f, {ad, 0, k}]; If[c === 0, 0, c adPower[k, x][ψ][d]])]
]

```