Pensieve header: AutoAd for ZeroCo.

```
SetDirectory["C:\\drorbn\\AcademicPensieve\\Projects\\OneCo-1604\\Zero"];
<< ZeroLocal.m
```

```
In "T before H" conventions. Internal use symbols: {rr, pp}
```

Export

```
AutoAd[B_, x_][y_] :=
  Module[{pows, states, i, s, seq, sh = 5, dseq, sf1, sf2, sf, t1, n},
   pows = NestList[B[x, #] &, y, 20];
   states = Union[Cases[pows, s_β | s_a :> ReplacePart[s, 1 → _], ∞]];
   UU@Sum[
     seq = Cases[{#}, states[[i]], ∞] & /@ pows;
     seq = Replace[seq, {{_[f_, ___]} :> f, {} → 0}, {1}];
     dseq = Drop[seq, sh];
     If[Union[Length[MonomialList[#]] & /@ dseq] === {1} ⋀
       Union[Length[FactorTermsList[#]] & /@ dseq] === {2},
      sf1 = FindSequenceFunction[FactorTermsList[#][[1]] & /@ dseq];
      sf2 = FindSequenceFunction[FactorTermsList[#][[2]] & /@ dseq];
      sf = (sf1[#] sf2[#] &),
      (*Else*) sf = FindSequenceFunction[dseq,
        FunctionSpace → {"ConstantRecursive", "HolonomicSequence",
          "Polynomial", "RationalFunction", "HypergeometricTerm"}]];
     ReplacePart[states[[i]], 1 → FullSimplify[∑_{n=0}^{sh-1} seq[[n+1]]/n! + ∑_{n=sh}^{∞} sf[n+1-sh]/n!]],
     {i, Length@states}]];
```

```
AutoAd[bb[j, k], UU@a[1, j, k]][UU@a[1, 0, j]]
```

$$UU\left[a[1, 0, j] + a\left[1 - e^{-b_j}, 0, k\right] + a\left[\frac{\left(-1 + e^{-b_j}\right) b_0}{b_j}, j, k\right]\right]$$

```
AutoAd[bb[j, k], UU@a[1, j, k]][UU@a[1, 0, k]]
```

$$UU\left[a\left[e^{-b_j}, 0, k\right] + a\left[\frac{\left(1 - e^{-b_j}\right) b_0}{b_j}, j, k\right]\right]$$

```
AutoAd[bb[j, k], UU@a[t, j, k]][UU@a[1, j, ∞]]
```

```
UU[a[1, j, ∞]]
```

```
AutoAd[bb[1, 2], UU@a[1, 1, 2]][UU@a[1, 1, 0]]
```

```
UU[a[1, 1, 0]]
```

```
AutoAd[bb[j, k], UU@a[t, j, k]][UU@a[1, k, ∞]]
```

$$UU\left[a\left[e^{t\,b_j},\,k,\,\infty\right]+a\left[-\frac{\left(-1+e^{t\,b_j}\right)\,b_k}{b_j},\,j,\,\infty\right]\right]$$

```
AutoAd[bb[1, 2], UU@a[1, 1, 2]][UU@a[1, 2, 0]]
```

$$UU\left[a\left[e^{b_1},\,2,\,0\right]+a\left[-\frac{\left(-1+e^{b_1}\right)\,b_2}{b_1},\,1,\,0\right]\right]$$

```
AutoAd[bb[i, j], UU@a[1, i, j]][UU@a[1, k, j]]
```

$$UU\left[a\left[e^{-b_i},\,k,\,j\right]+a\left[\frac{\left(1-e^{-b_i}\right)\,b_k}{b_i},\,i,\,j\right]\right]$$

```
AutoAd[bb[i, j], UU@a[1, i, j]][UU@a[1, k, i]]
```

$$UU\left[a[1,\,k,\,i]+a\left[1-e^{-b_i},\,k,\,j\right]+a\left[\frac{\left(-1+e^{-b_i}\right)\,b_k}{b_i},\,i,\,j\right]\right]$$

```
AutoAd[bb[i, j], UU@a[1, i, j]][UU@a[1, j, k]]
```

$$UU\left[a\left[e^{b_i},\,j,\,k\right]+a\left[-\frac{\left(-1+e^{b_i}\right)\,b_j}{b_i},\,i,\,k\right]\right]$$

```
AutoAd[bb[i, j], UU@a[1, i, j]][UU@a[1, j, i]]
```

$$UU\left[a\left[e^{b_i},\,j,\,i\right]+a\left[-1+e^{b_i},\,j,\,j\right]+a\left[-\frac{\left(-1+e^{b_i}\right)\,b_j}{b_i},\,i,\,i\right]+a\left[-\frac{\left(-1+e^{b_i}\right)\,b_j}{b_i},\,i,\,j\right]\right]$$