gfun[poltorec] - determine recurrence satisfied by a polynomial in holonomic sequences

Calling Sequence

poltorec(**P**, **listrec**, **list_unknowns**, **u(n)**)

Parameters

`P` – polynomial in **z** and the (possibly shifted) variables in list_unknowns

`listrec` – list containing, for each of the variables in **list_unknowns**, either a linear recurrence equation or a set containing the equation together with initial conditions

`list_unknowns` – list of the unknowns **[u1(z), u2(z),...]**, in the same order as in **listrec**

`u,n` – the name of the holonomic sequence and the generic variable

Description

- If **u1(n)**, **u2(n)**,... are holonomic sequences solutions of **listrec[1]**, **listrec[2]**,..., **poltorec** outputs a linear recurrence equation verified by **P(n,u1(n),...)**.

Examples

```
> with(gfun):
  rec1:={u1(n+1)=(n+1)*u1(n),u1(0)=1}:
  rec2:={u2(n+2)=2*u2(n+1)-3*n*u2(n),u2(1)=1,u2(0)=1}:
  poltorec(u1(n)^2+2*u1(n)*u2(n),[rec1,rec2],[u1(n),u2(n)],u(n));
```

$$\{(-579 n^3 - 192 n^5 - 363 n^2 - 39 n^6 - 90 n - 462 n^4 - 3 n^7) u(n) + (60 + 254 n + 209 n^3 + 354 n^2 + 54 n^4 + 5 n^5) u(n+1) + (-62 n - 12 n^3 - 46 n^2 - 15 - n^4) u(n+2) + (4 n + n^2) u(n+3), u(0) = 3, u(1) = 3, u(2) = 12, u(3) = 48\} \quad (2.1)$$

Cassini's identity:

```
> fib:={F(n+2)=F(n+1)+F(n),F(0)=1,F(1)=1}:
  poltorec(F(n+2)*F(n)-F(n+1)^2,[fib],[F(n)],f(n));
```

$$\{f(n+1) + f(n), f(0) = 1\} \quad (2.2)$$

See Also

gfun, gfun[parameters], gfun[rec+rec], gfun[rec*rec], gfun[poltodiffeq]