gfun[algebraicsubs] - substitute an algebraic function into an holonomic one

Calling Sequence

algebraicsubs(**deq**, **eq**, **y(z)**, **ini**)

Parameters

`deq` - linear differential equation in **y(z)** with polynomial coefficients

`eq` - algebraic equation in **y(z)**

`y` - name of the holonomic function

`z` - name of the generic variable associated with **y**

`ini` - (optional) initial conditions to specify a solution of **eq**

Description

- Let **f** be the holonomic function defined by the equation **deq**, and **g** be the algebraic equation defined by **eq**, then **gfun[algebraicsubs]** outputs a differential equation satisfied by the composition **f@g**, which is holonomic by closure properties of holonomic functions.
- Let **d1** be the differential order of **deq**, and **d2** be the degree of **eq**. If the equation **deq** is homogeneous, then the order of **f@g** is at most **d1*d2** otherwise it is at most **(d1+1)*d2**

Examples

The differential equation satisfied by cos(t):

```
> with(gfun):
  deq := (D@@2)(f)(t)+f(t):
```

The algebraic equation satisfied by sqrt(1-4*t):

```
> eq := algfuntoalgeq(sqrt(1-4*t),f(t)):
```

The differential equation satisfied by cos(sqrt(1-4*t)):

```
> algebraicsubs(deq,eq,f(t));
```

$$-4 f(t) + 2 \left(\frac{\mathrm{d}}{\mathrm{d}t} f(t) \right) + (-1 + 4t) \left(\frac{\mathrm{d}^2}{\mathrm{d}t^2} f(t) \right) \qquad \textbf{(2.1)}$$

See Also

gfun, gfun[parameters], gfun[algfuntoalgeq], gfun[diffeq+diffeq], gfun[rec+rec]