gfun[holexprtodiffeq] - produce a differential equation satisfied by a holonomic expression

Calling Sequence

holexprtodiffeq(**expr**, **y(z)**)

Parameters

expr – holonomic expression in **y(z)**

y,z – name of the holonomic function and the generic variable

▼ Description

- If **expr** is a holonomic expression, then **gfun[holexprtodiffeq]** returns a differential equation in **y** and **z** that is satisfied by expr. Initial conditions are given whenever possible.

- Not all holonomic functions are recognized by **holexprtodiffeq**. It currently knows about the following functions:

```
BesselI   BesselJ   BesselK   BesselY   arccos   arccosh
arccot    arccoth   arccsc    arccsch   arcsec   arcsech
arcsin    arcsinh   arctan    arctanh   cos      cosh
erf       erfc      exp       ln        sin      sinh
```

▼ Examples

```
> with(gfun):
  holexprtodiffeq(BesselJ(2,x),y(x));
```

$$\left\{ x^2 \left(\frac{d^2}{dx^2} y(x) \right) + x \left(\frac{d}{dx} y(x) \right) + (x^2 - 4) y(x), \, D^{(2)}(y)(0) = \frac{1}{4}, D^{(3)}(y)(0) = 0, \right.$$

$$\left. y(0) = 0, D(y)(0) = 0 \right\}$$ **(2.1)**

```
> holexprtodiffeq(arcsec(1/x)+sin(x)^2,y(x));
```

$$\left\{ D^{(2)}(y)(0) = 2, D^{(3)}(y)(0) = -1, D(y)(0) = -1, y(0) = \frac{1}{2}\pi, \left(-8 x^3 + 52 x \right. \right.$$ **(2.2)**

$$\left. + 16 x^5 \right) \left(\frac{d}{dx} y(x) \right) + \left(-40 x^4 + 44 x^2 + 16 x^6 - 20 \right) \left(\frac{d^2}{dx^2} y(x) \right) + \left(-2 x^3 \right.$$

$$\left. + 13 x + 4 x^5 \right) \left(\frac{d^3}{dx^3} y(x) \right) + \left(-10 x^4 + 11 x^2 + 4 x^6 - 5 \right) \left(\frac{d^4}{dx^4} y(x) \right) \right\}$$

▼ See Also

gfun, gfun[diffeqtorec], gfun[diffeqtohomdiffeq]