

$$\begin{aligned}
&> \text{restart} \\
&> \text{SolHom} := y(x) = 4 \cdot \cos(\log(x)) + 10 \cdot \sin(\log(x)) \\
&\quad \text{SolHom} := y(x) = 4 \cos(\ln(x)) + 10 \sin(\ln(x)) \tag{1} \\
&= \\
&> \text{EcuaHom} := x^2 \cdot y'' + x \cdot y' + y = 0 \\
&\quad \text{EcuaHom} := x^2 \left( \frac{d^2}{dx^2} y(x) \right) + x \left( \frac{d}{dx} y(x) \right) + y(x) = 0 \tag{2} \\
&= \\
&> \text{CondHom} := y(1) = 4, D(y)(1) = 10 \\
&\quad \text{CondHom} := y(1) = 4, D(y)(1) = 10 \tag{3} \\
&= \\
&> \text{ComprobarUno} := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{SolHom}), \text{EcuaHom}))) \\
&\quad \text{ComprobarUno} := 0 = 0 \tag{4} \\
&= \\
&> \text{ComprobarDos} := \text{simplify}(\text{subs}(x = 1, \text{SolHom})) \\
&\quad \text{ComprobarDos} := y(1) = 4 \tag{5} \\
&= \\
&> \text{ComprobarTres} := D(y)(1) = \text{simplify}(\text{subs}(x = 1, \text{rhs}(\text{diff}(\text{SolHom}, x)))) \\
&\quad \text{ComprobarTres} := D(y)(1) = 10 \tag{6} \\
&= \\
&> yy[1] := \cos(\log(x)); yy[2] := \sin(\log(x)) \\
&\quad yy_1 := \cos(\ln(x)) \\
&\quad yy_2 := \sin(\ln(x)) \tag{7} \\
&= \\
&> \text{EcuaNoHom} := \text{lhs}(\text{EcuaHom}) = \log(x) \\
&\quad \text{EcuaNoHom} := x^2 \left( \frac{d^2}{dx^2} y(x) \right) + x \left( \frac{d}{dx} y(x) \right) + y(x) = \ln(x) \tag{8} \\
&= \\
&> \text{EcuaBis} := \text{expand}\left(\frac{\text{lhs}(\text{EcuaNoHom})}{x^2}\right) = \frac{\text{rhs}(\text{EcuaNoHom})}{x^2} \\
&\quad \text{EcuaBis} := \frac{d^2}{dx^2} y(x) + \frac{\frac{d}{dx} y(x)}{x} + \frac{y(x)}{x^2} = \frac{\ln(x)}{x^2} \tag{9} \\
&= \\
&> Q := \text{rhs}(\text{EcuaBis}) \\
&\quad Q := \frac{\ln(x)}{x^2} \tag{10} \\
&= \\
&> \text{with}(\text{linalg}) : \\
&> WW := \text{wronskian}([yy[1], yy[2]], x) \\
&\quad WW := \begin{bmatrix} \cos(\ln(x)) & \sin(\ln(x)) \\ -\frac{\sin(\ln(x))}{x} & \frac{\cos(\ln(x))}{x} \end{bmatrix} \tag{11} \\
&= \\
&> BB := \text{array}([0, Q]) \\
&\quad BB := \begin{bmatrix} 0 & \frac{\ln(x)}{x^2} \end{bmatrix} \tag{12} \\
&= \\
&> \text{ParaVar} := \text{simplify}(\text{linsolve}(WW, BB)) \tag{13}
\end{aligned}$$

$$ParaVar := \left[ -\frac{\ln(x) \sin(\ln(x))}{x} \quad \frac{\ln(x) \cos(\ln(x))}{x} \right] \quad (13)$$

> Aprima := ParaVar[1]; Bprima := ParaVar[2]

$$\begin{aligned} Aprima &:= -\frac{\ln(x) \sin(\ln(x))}{x} \\ Bprima &:= \frac{\ln(x) \cos(\ln(x))}{x} \end{aligned} \quad (14)$$

> SolGralNoHom := y(x) = simplify( (int(Aprima, x) + \_C1)·yy[1] + (int(Bprima, x) + \_C2)·yy[2] )

$$SolGralNoHom := y(x) = \cos(\ln(x)) \_C1 + \sin(\ln(x)) \_C2 + \ln(x) \quad (15)$$

> EcuaParUno := simplify(subs(x=1, rhs(SolGralNoHom) = 4) )

$$EcuaParUno := \_C1 = 4 \quad (16)$$

> EcuaParDos := simplify(subs(x=1, rhs(diff(SolGralNoHom, x)) = 10) )

$$EcuaParDos := 1 + \_C2 = 10 \quad (17)$$

> ParaBis := solve( {EcuaParUno, EcuaParDos}, {\_C1, \_C2} )

$$ParaBis := \{ \_C1 = 4, \_C2 = 9 \} \quad (18)$$

> SolPartNoHom := subs(\_C1 = rhs(ParaBis[1]), \_C2 = rhs(ParaBis[2]), SolGralNoHom)

$$SolPartNoHom := y(x) = 4 \cos(\ln(x)) + 9 \sin(\ln(x)) + \ln(x) \quad (19)$$

> ComprobarCuatro := simplify(eval(subs(y(x) = rhs(SolPartNoHom), EcuaBis) ) )

$$ComprobarCuatro := \frac{\ln(x)}{x^2} = \frac{\ln(x)}{x^2} \quad (20)$$

> ComprobarCinco := simplify(subs(x=1, SolPartNoHom) )

$$ComprobarCinco := y(1) = 4 \quad (21)$$

> ComprobarSeis := D(y)(1) = simplify(subs(x=1, rhs(diff(SolPartNoHom, x))))

$$ComprobarSeis := D(y)(1) = 10 \quad (22)$$

> restart

> f := x<sup>2</sup>

$$f := x^2 \quad (23)$$

> with(inttrans);

[addtable, fourier, fouriercos, fouriersin, hankel, hilbert, invfourier, invhilbert, invlaplace, invmellin, laplace, mellin, savetable, setup]

> F := laplace(f, x, s)

$$F := \frac{2}{s^3} \quad (25)$$

> g := t·cos(5 t)

$$g := t \cos(5 t) \quad (26)$$

> G := laplace(g, t, s)

$$G := \frac{s^2 - 25}{(s^2 + 25)^2} \quad (27)$$

