> *restart*

> $Ecua := y''-2\cdot y'+5\cdot y=3\cdot\exp(2\cdot x)$

$$Ecua := \frac{d^2}{dx^2}\, y(x) - 2\left(\frac{d}{dx}\, y(x)\right) + 5\, y(x) = 3\, e^{2\,x} \qquad \textbf{(1)}$$

PRIMERA POSIBLE SOLUCIÓN

> $Q := rhs(Ecua)$

$$Q := 3\, e^{2\,x} \qquad \textbf{(2)}$$

> $Cond := y(0)=-3, D(y)(0)=12$

$$Cond := y(0) = -3, D(y)(0) = 12 \qquad \textbf{(3)}$$

> $EcuaHom := lhs(Ecua)=0$

$$EcuaHom := \frac{d^2}{dx^2}\, y(x) - 2\left(\frac{d}{dx}\, y(x)\right) + 5\, y(x) = 0 \qquad \textbf{(4)}$$

> $EcuaCarac := m^2-2\cdot m+5=0$

$$EcuaCarac := m^2 - 2\, m + 5 = 0 \qquad \textbf{(5)}$$

> $Raiz := solve(EcuaCarac)$

$$Raiz := 1 + 2\, I, 1 - 2\, I \qquad \textbf{(6)}$$

> $yy[1] := \exp(\mathrm{Re}(Raiz[1])\cdot x)\cdot\cos(\mathrm{Im}(Raiz[1])\cdot x); yy[2] := \exp(\mathrm{Re}(Raiz[1])\cdot x)\cdot\sin(\mathrm{Im}(Raiz[1])\cdot x)$

$$yy_1 := e^{x}\cos(2\,x)$$

$$yy_2 := e^{x}\sin(2\,x) \qquad \textbf{(7)}$$

> $SolHomAsoc := y(x) = \_C1\cdot yy[1] + \_C2\cdot yy[2]$

$$SolHomAsoc := y(x) = \_C1\, e^{x}\cos(2\,x) + \_C2\, e^{x}\sin(2\,x) \qquad \textbf{(8)}$$

> $SolGral := y(x) = A(x)\cdot yy[1] + B(x)\cdot yy[2]$

$$SolGral := y(x) = A(x)\, e^{x}\cos(2\,x) + B(x)\, e^{x}\sin(2\,x) \qquad \textbf{(9)}$$

> $with(linalg):$

> $WW := wronskian([yy[1], yy[2]], x)$

$$WW := \begin{bmatrix} e^{x}\cos(2\,x) & e^{x}\sin(2\,x) \\ e^{x}\cos(2\,x) - 2\, e^{x}\sin(2\,x) & e^{x}\sin(2\,x) + 2\, e^{x}\cos(2\,x) \end{bmatrix} \qquad \textbf{(10)}$$

> $BB := array([0, Q])$

$$BB := \begin{bmatrix} 0 & 3\, e^{2\,x} \end{bmatrix} \qquad \textbf{(11)}$$

> $DerParVar := linsolve(WW, BB) : Aprima := simplify(DerParVar[1]); Bprima := simplify(DerParVar[2])$

$$Aprima := -\frac{3}{2}\, e^{x}\sin(2\,x)$$

$$Bprima := \frac{3}{2}\, e^{x}\cos(2\,x) \qquad \textbf{(12)}$$

> $A(x) := int(Aprima, x) + \_C1; B(x) := int(Bprima, x) + \_C2$

$$A(x) := \frac{3}{5}\, e^{x}\cos(2\,x) - \frac{3}{10}\, e^{x}\sin(2\,x) + \_C1$$

(13)

$$B(x) := \frac{3}{10}\,e^{x}\cos(2\,x) + \frac{3}{5}\,e^{x}\sin(2\,x) + \_C2 \tag{13}$$

> *SolNoHom* := *SolGral*

$$SolNoHom := y(x) = \left(\frac{3}{5}\,e^{x}\cos(2\,x) - \frac{3}{10}\,e^{x}\sin(2\,x) + \_C1\right)e^{x}\cos(2\,x) + \left(\frac{3}{10}\,e^{x}\cos(2\,x) + \frac{3}{5}\,e^{x}\sin(2\,x) + \_C2\right)e^{x}\sin(2\,x) \tag{14}$$

> *PrimeraCondicion* := eval(subs(x = 0, rhs(SolNoHom) = -3))

$$PrimeraCondicion := \frac{3}{5} + \_C1 = -3 \tag{15}$$

> *SegundaCondicion* := eval(subs(x = 0, rhs(diff(SolNoHom, x)) = 12))

$$SegundaCondicion := \frac{6}{5} + \_C1 + 2\,\_C2 = 12 \tag{16}$$

> *Para*[1] := isolate(PrimeraCondicion, _C1)

$$Para_1 := \_C1 = -\frac{18}{5} \tag{17}$$

> *Para*[2] := isolate(subs(_C1 = rhs(Para[1]), SegundaCondicion), _C2)

$$Para_2 := \_C2 = \frac{36}{5} \tag{18}$$

> *SolPart* := simplify(subs(_C1 = rhs(Para[1]), _C2 = rhs(Para[2]), SolNoHom))

$$SolPart := y(x) = -\frac{3}{5}\,e^{x}\left(-e^{x} + 6\cos(2\,x) - 12\sin(2\,x)\right) \tag{19}$$

comprobaciones

> *SolPartDos* := dsolve({Ecua, Cond})

$$SolPartDos := y(x) = \frac{36}{5}\,e^{x}\sin(2\,x) - \frac{18}{5}\,e^{x}\cos(2\,x) + \frac{3}{5}\,e^{2\,x} \tag{20}$$

> *Condicion*[1] := simplify(subs(x = 0, SolPart))

$$Condicion_1 := y(0) = -3 \tag{21}$$

> *Condicion*[2] := D(y)(0) = simplify(subs(x = 0, rhs(diff(SolPart, x))))

$$Condicion_2 := D(y)(0) = 12 \tag{22}$$

> *Cond*

$$y(0) = -3,\ D(y)(0) = 12 \tag{23}$$

> *restart*

> *Ecua* := y'' - 2·y' + 5·y = 3·exp(2·x)

$$Ecua := \frac{d^2}{dx^2}\,y(x) - 2\left(\frac{d}{dx}\,y(x)\right) + 5\,y(x) = 3\,e^{2\,x} \tag{24}$$

SEGUNDA POSIBLE SOLUCIÓN

> *Q* := rhs(Ecua)

$$Q := 3\,e^{2\,x} \tag{25}$$

> *Cond* := y(0) = 4, D(y)(0) = -8

$$Cond := y(0) = 4,\ D(y)(0) = -8 \tag{26}$$

> *EcuaHom* := lhs(Ecua) = 0

(27)

$$EcuaHom := \frac{d^2}{dx^2} y(x) - 2 \left(\frac{d}{dx} y(x) \right) + 5 y(x) = 0 \quad (27)$$

> $EcuaCarac := m^2 - 2 \cdot m + 5 = 0$

$$EcuaCarac := m^2 - 2 m + 5 = 0 \quad (28)$$

> $Raiz := solve(EcuaCarac)$

$$Raiz := 1 + 2 I, 1 - 2 I \quad (29)$$

> $yy[1] := \exp(\mathrm{Re}(Raiz[1]) \cdot x) \cdot \cos(\mathrm{Im}(Raiz[1]) \cdot x); yy[2] := \exp(\mathrm{Re}(Raiz[1]) \cdot x) \cdot \sin(\mathrm{Im}(Raiz[1]) \cdot x)$

$$yy_1 := e^x \cos(2 x)$$

$$yy_2 := e^x \sin(2 x) \quad (30)$$

> $SolHomAsoc := y(x) = \_C1 \cdot yy[1] + \_C2 \cdot yy[2]$

$$SolHomAsoc := y(x) = \_C1\, e^x \cos(2 x) + \_C2\, e^x \sin(2 x) \quad (31)$$

> $SolGral := y(x) = A(x) \cdot yy[1] + B(x) \cdot yy[2]$

$$SolGral := y(x) = A(x)\, e^x \cos(2 x) + B(x)\, e^x \sin(2 x) \quad (32)$$

> $with(linalg):$

> $WW := wronskian([yy[1], yy[2]], x)$

$$WW := \begin{bmatrix} e^x \cos(2 x) & e^x \sin(2 x) \\ e^x \cos(2 x) - 2 e^x \sin(2 x) & e^x \sin(2 x) + 2 e^x \cos(2 x) \end{bmatrix} \quad (33)$$

> $BB := array([0, Q])$

$$BB := \begin{bmatrix} 0 & 3 e^{2 x} \end{bmatrix} \quad (34)$$

> $DerParVar := linsolve(WW, BB) : Aprima := simplify(DerParVar[1]); Bprima := simplify(DerParVar[2])$

$$Aprima := -\frac{3}{2} e^x \sin(2 x)$$

$$Bprima := \frac{3}{2} e^x \cos(2 x) \quad (35)$$

> $A(x) := int(Aprima, x) + \_C1; B(x) := int(Bprima, x) + \_C2$

$$A(x) := \frac{3}{5} e^x \cos(2 x) - \frac{3}{10} e^x \sin(2 x) + \_C1$$

$$B(x) := \frac{3}{10} e^x \cos(2 x) + \frac{3}{5} e^x \sin(2 x) + \_C2 \quad (36)$$

> $SolNoHom := SolGral$

$$SolNoHom := y(x) = \left(\frac{3}{5} e^x \cos(2 x) - \frac{3}{10} e^x \sin(2 x) + \_C1 \right) e^x \cos(2 x) + \left(\frac{3}{10} e^x \cos(2 x) + \frac{3}{5} e^x \sin(2 x) + \_C2 \right) e^x \sin(2 x) \quad (37)$$

> $PrimeraCondicion := eval(subs(x = 0, rhs(SolNoHom) = 4))$

$$PrimeraCondicion := \frac{3}{5} + \_C1 = 4 \quad (38)$$

> $SegundaCondicion := eval(subs(x = 0, rhs(diff(SolNoHom, x)) = -8))$

$$SegundaCondicion := \frac{6}{5} + \_C1 + 2\,\_C2 = -8 \qquad \textbf{(39)}$$

> $Para[1] := isolate(PrimeraCondicion, \_C1)$

$$Para_1 := \_C1 = \frac{17}{5} \qquad \textbf{(40)}$$

> $Para[2] := isolate(subs(\_C1 = rhs(Para[1]), SegundaCondicion), \_C2)$

$$Para_2 := \_C2 = -\frac{63}{10} \qquad \textbf{(41)}$$

> $SolPart := simplify(subs(\_C1 = rhs(Para[1]), \_C2 = rhs(Para[2]), SolNoHom))$

$$SolPart := y(x) = \frac{1}{10}\, e^{x} \left(6\, e^{x} + 34 \cos(2\,x) - 63 \sin(2\,x)\right) \qquad \textbf{(42)}$$

comprobaciones

> $SolPartDos := dsolve(\{Ecua, \mathrm{Cond}\})$

$$SolPartDos := y(x) = -\frac{63}{10}\, e^{x} \sin(2\,x) + \frac{17}{5}\, e^{x} \cos(2\,x) + \frac{3}{5}\, e^{2\,x} \qquad \textbf{(43)}$$

> $Condicion[1] := simplify(subs(x = 0, SolPart))$

$$Condicion_1 := y(0) = 4 \qquad \textbf{(44)}$$

> $Condicion[2] := \mathrm{D}(y)(0) = simplify(subs(x = 0, rhs(diff(SolPart, x))))$

$$Condicion_2 := \mathrm{D}(y)(0) = -8 \qquad \textbf{(45)}$$

> $Cond$

$$y(0) = 4, \mathrm{D}(y)(0) = -8 \qquad \textbf{(46)}$$

> $restart$

>