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> restart
> Ecua := y'' - 5·y' + 6·y = 4·exp(x) + 3·exp(4·x)
      Ecua :=  $\frac{d^2}{dx^2} y(x) - 5 \frac{d}{dx} y(x) + 6 y(x) = 4 e^x + 3 e^{4x}$  (1)
=
> Q := rhs(Ecua)
      Q :=  $4 e^x + 3 e^{4x}$  (2)
=
> EcuaCarac := m^2 - 5·m + 6 = 0
      EcuaCarac :=  $m^2 - 5 m + 6 = 0$  (3)
=
> Raiz := solve(EcuaCarac)
      Raiz := 3, 2 (4)
=
> yy[1] := exp(Raiz[1]·x); yy[2] := exp(Raiz[2]·x)
      yy1 :=  $e^{3x}$ 
      yy2 :=  $e^{2x}$  (5)
=
> with(linalg) :
> WWW := wronskian([yy[1], yy[2]], x)
      WWW :=  $\begin{bmatrix} e^{3x} & e^{2x} \\ 3 e^{3x} & 2 e^{2x} \end{bmatrix}$  (6)
=
> BB := array([0, Q])
      BB :=  $\begin{bmatrix} 0 & 4 e^x + 3 e^{4x} \end{bmatrix}$  (7)
=
> ParaVar := linsolve(WWW, BB)
      ParaVar :=  $\begin{bmatrix} \frac{4 e^x + 3 e^{4x}}{e^{3x}} & -\frac{4 e^x + 3 e^{4x}}{e^{2x}} \end{bmatrix}$  (8)
=
> Aprima := ParaVar[1]; Bprima := ParaVar[2]
      Aprima :=  $\frac{4 e^x + 3 e^{4x}}{e^{3x}}$ 
      Bprima :=  $-\frac{4 e^x + 3 e^{4x}}{e^{2x}}$  (9)
=
> SolGralNoHom := y(x) = simplify((int(Aprima, x) + _C1)·yy[1] + (int(Bprima, x) + _C2)·yy[2])
      SolGralNoHom :=  $y(x) = 2 e^x + \frac{3 e^{4x}}{2} + e^{3x} _C1 + e^{2x} _C2$  (10)
=
> Comprobar := simplify(eval(subs(y(x) = rhs(SolGralNoHom), Ecua)))
      Comprobar :=  $4 e^x + 3 e^{4x} = 4 e^x + 3 e^{4x}$  (11)
=
> restart
> Ecua := y''' + y'' + y' + y = 2·exp(x) + 3·x·exp(x)
      Ecua :=  $\frac{d^3}{dx^3} y(x) + \frac{d^2}{dx^2} y(x) + \frac{d}{dx} y(x) + y(x) = 2 e^x + 3 x e^x$  (12)

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$$\begin{aligned} &> Q := rhs(Ecua) \\ & \qquad \qquad \qquad Q := 2 e^x + 3 x e^x \end{aligned} \tag{13}$$

$$\begin{aligned} &> EcuaCarac := m^3 + m^2 + m + 1 = 0 \\ & \qquad \qquad \qquad EcuaCarac := m^3 + m^2 + m + 1 = 0 \end{aligned} \tag{14}$$

$$\begin{aligned} &> Raiz := solve(EcuaCarac) \\ & \qquad \qquad \qquad Raiz := -1, I, -I \end{aligned} \tag{15}$$

$$\begin{aligned} &> yy[1] := \exp(Raiz[1] \cdot x); yy[2] := \cos(\text{Im}(Raiz[2]) \cdot x); yy[3] := \sin(\text{Im}(Raiz[2]) \cdot x); \\ & \qquad \qquad \qquad yy_1 := e^{-x} \\ & \qquad \qquad \qquad yy_2 := \cos(x) \\ & \qquad \qquad \qquad yy_3 := \sin(x) \end{aligned} \tag{16}$$

$$\begin{aligned} &> with(linalg): \\ &> WWW := wronskian([yy[1], yy[2], yy[3]], x) \\ & \qquad \qquad \qquad WWW := \begin{bmatrix} e^{-x} & \cos(x) & \sin(x) \\ -e^{-x} & -\sin(x) & \cos(x) \\ e^{-x} & -\cos(x) & -\sin(x) \end{bmatrix} \end{aligned} \tag{17}$$

$$\begin{aligned} &> BB := array([0, 0, Q]) \\ & \qquad \qquad \qquad BB := \begin{bmatrix} 0 & 0 & 2 e^x + 3 x e^x \end{bmatrix} \end{aligned} \tag{18}$$

$$\begin{aligned} &> ParaVar := simplify(linsolve(WWW, BB)) \\ ParaVar := & \end{aligned} \tag{19}$$

$$\left[\frac{(3x+2)e^{2x}}{2} - \frac{3(\cos(x) + \sin(x)) \left(x + \frac{2}{3}\right) e^x}{2} - \frac{e^x(3x+2)(\cos(x) - \sin(x))}{2} \right]$$

$$\begin{aligned} &> Aprima := ParaVar[1]; Bprima := ParaVar[2]; Dprima := ParaVar[3] \\ & \qquad \qquad \qquad Aprima := \frac{(3x+2)e^{2x}}{2} \\ & \qquad \qquad \qquad Bprima := -\frac{3(\cos(x) + \sin(x)) \left(x + \frac{2}{3}\right) e^x}{2} \\ & \qquad \qquad \qquad Dprima := \frac{e^x(3x+2)(\cos(x) - \sin(x))}{2} \end{aligned} \tag{20}$$

$$\begin{aligned} &> SolGral := y(x) = simplify((int(Aprima, x) + _C1) \cdot yy[1] + (int(Bprima, x) + _C2) \cdot yy[2] \\ & \qquad \qquad \qquad + (int(Dprima, x) + _C3) \cdot yy[3]) \\ & \qquad \qquad \qquad SolGral := y(x) = e^{-x} _C1 + \frac{(6x-5)e^x}{8} + \cos(x) _C2 + \sin(x) _C3 \end{aligned} \tag{21}$$

$$\begin{aligned} &> SolucionGral := simplify(dsolve(Ecua)) \\ & \qquad \qquad \qquad SolucionGral := y(x) = c_3 e^{-x} + \frac{(6x-5)e^x}{8} + c_1 \cos(x) + c_2 \sin(x) \end{aligned} \tag{22}$$

>

Ecua

$$\frac{d^3}{dx^3} y(x) + \frac{d^2}{dx^2} y(x) + \frac{d}{dx} y(x) + y(x) = 2 e^x + 3 x e^x$$

(23)

>

Comprobar := simplify(eval(subs(y(x) = rhs(SolucionGral), Ecua)))

Comprobar := e^x (3 x + 2) = e^x (3 x + 2)

(24)