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> restart
> Ecua := y'' - 2·y' + 2·y = 4·exp(2 x)·cos(2 x)
      Ecua :=  $\frac{d^2}{dx^2} y(x) - 2 \frac{d}{dx} y(x) + 2 y(x) = 4 e^{2x} \cos(2 x)$  (1)
=
> SolGral := y(x) = C[1]·exp(x)·cos(x) + C[2]·exp(x)·sin(x) -  $\frac{2}{5} \cdot \exp(2 x) \cdot \cos(2 x) + \frac{4}{5}$ 
      ·exp(2 x)·sin(2 x)
      SolGral :=  $y(x) = C_1 e^x \cos(x) + C_2 e^x \sin(x) - \frac{2 e^{2x} \cos(2 x)}{5} + \frac{4 e^{2x} \sin(2 x)}{5}$  (2)
=
> Comprobar := simplify(eval(subs(y(x) = rhs(SolGral), lhs(Ecua) - rhs(Ecua) = 0)))
      Comprobar := 0 = 0 (3)
=
> Sistema := -2·A + 4·B = 4, -4·A - 2·B = 0 : Sistema[1]; Sistema[2]
      -2 A + 4 B = 4
      -4 A - 2 B = 0 (4)
=
> Para := solve({Sistema}, {A, B})
      Para :=  $\left\{ A = -\frac{2}{5}, B = \frac{4}{5} \right\}$  (5)
=
> Ecua
       $\frac{d^2}{dx^2} y(x) - 2 \frac{d}{dx} y(x) + 2 y(x) = 4 e^{2x} \cos(2 x)$  (6)
=
> SolNoHom := y(x) = A·exp(x)·cos(x) + B·exp(x)sin(x)
      SolNoHom :=  $y(x) = A e^x \cos(x) + B e^x \sin(x)$  (7)
=
> ParaDos := eval(subs(y(x) = rhs(SolNoHom), lhs(Ecua)))
      ParaDos := 0 (8)
=
> restart
> Ecua := y'' - 5·y' + 6·y = 4·exp(2 x) - x2
      Ecua :=  $\frac{d^2}{dx^2} y(x) - 5 \frac{d}{dx} y(x) + 6 y(x) = 4 e^{2x} - x^2$  (9)
=
> EcuaDos := lhs(Ecua) = 0
      EcuaDos :=  $\frac{d^2}{dx^2} y(x) - 5 \frac{d}{dx} y(x) + 6 y(x) = 0$  (10)
=
> Q := rhs(Ecua)
      Q :=  $4 e^{2x} - x^2$  (11)
=
> EcuaCarac := m2 - 5·m + 6 = 0
      EcuaCarac :=  $m^2 - 5 m + 6 = 0$  (12)
=
> Raiz := solve(EcuaCarac)
      Raiz := 3, 2 (13)
=
> yy[1] := exp(Raiz[1]·x); yy[2] := exp(Raiz[2]·x)
      yy1 := e3x

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$$yy_2 := e^{2x} \quad (14)$$

> with(linalg) :

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

$$WW := \begin{bmatrix} e^{3x} & e^{2x} \\ 3e^{3x} & 2e^{2x} \end{bmatrix} \quad (15)$$

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

$$BB := \begin{bmatrix} 0 & 4e^{2x} - x^2 \end{bmatrix} \quad (16)$$

> ParaVar := linsolve(WW, BB)

$$ParaVar := \begin{bmatrix} \frac{4e^{2x} - x^2}{e^{3x}} & -\frac{4e^{2x} - x^2}{e^{2x}} \end{bmatrix} \quad (17)$$

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

$$Aprima := \frac{4e^{2x} - x^2}{e^{3x}}$$

$$Bprima := -\frac{4e^{2x} - x^2}{e^{2x}} \quad (18)$$

> A := int(Aprima, x)

$$A := -\frac{4}{e^x} + \frac{x^2}{3(e^x)^3} + \frac{2x}{9(e^x)^3} + \frac{2}{27(e^x)^3} \quad (19)$$

> B := int(Bprima, x)

$$B := -4x - \frac{x^2}{2e^{2x}} - \frac{x}{2e^{2x}} - \frac{1}{4e^{2x}} \quad (20)$$

> SolaGral := y(x) = expand((A + C[1])·yy[1] + (B + C[2])·yy[2])

$$SolaGral := y(x) = -4(e^x)^2 - \frac{x^2}{6} - \frac{5x}{18} - \frac{19}{108} + (e^x)^3 C_1 - 4(e^x)^2 x + (e^x)^2 C_2 \quad (21)$$

> SolFinal := y(x) = C[10]·exp(3x) + C[20]·exp(2x) - \frac{x^2}{6} - \frac{5x}{18} - \frac{19}{108} - 4·x·exp(2x)

$$SolFinal := y(x) = C_{10} e^{3x} + C_{20} e^{2x} - \frac{x^2}{6} - \frac{5x}{18} - \frac{19}{108} - 4x e^{2x} \quad (22)$$

> restart

> Ecua := y'' - 2·y' + 2·y = 4·exp(2x)·cos(2x)

$$Ecua := \frac{d^2}{dx^2} y(x) - 2 \frac{d}{dx} y(x) + 2 y(x) = 4 e^{2x} \cos(2x) \quad (23)$$

> EcuaHom := lhs(Ecua) = 0

$$EcuaHom := \frac{d^2}{dx^2} y(x) - 2 \frac{d}{dx} y(x) + 2 y(x) = 0 \quad (24)$$

> Q := rhs(Ecua)

$$(25)$$

$$Q := 4 e^{2x} \cos(2x) \quad (25)$$

$$\begin{aligned} > \text{EcuaCarac} := m^2 - 2 \cdot m + 2 = 0 \\ & \text{EcuaCarac} := m^2 - 2m + 2 = 0 \end{aligned} \quad (26)$$

$$\begin{aligned} > \text{Raiz} := \text{solve}(\text{EcuaCarac}) \\ & \text{Raiz} := 1 + I, 1 - I \end{aligned} \quad (27)$$

$$\begin{aligned} > yy[1] &:= \exp(\text{Re}(\text{Raiz}[1]) \cdot x) \cdot \cos(\text{Im}(\text{Raiz}[1]) \cdot x); yy[2] := \exp(\text{Re}(\text{Raiz}[1]) \cdot x) \\ & \quad \cdot \sin(\text{Im}(\text{Raiz}[1]) \cdot x) \\ & yy_1 := e^x \cos(x) \\ & yy_2 := e^x \sin(x) \end{aligned} \quad (28)$$

$$\begin{aligned} > \text{with}(\text{linalg}) : \\ > WW := \text{wronskian}([yy[1], yy[2]], x) \\ & WW := \begin{bmatrix} e^x \cos(x) & e^x \sin(x) \\ e^x \cos(x) - e^x \sin(x) & e^x \sin(x) + e^x \cos(x) \end{bmatrix} \end{aligned} \quad (29)$$

$$\begin{aligned} > BB := \text{array}([0, Q]) \\ & BB := \begin{bmatrix} 0 & 4 e^{2x} \cos(2x) \end{bmatrix} \end{aligned} \quad (30)$$

$$\begin{aligned} > \text{ParaVar} := \text{simplify}(\text{linsolve}(WW, BB)) \\ & \text{ParaVar} := \begin{bmatrix} -4 \sin(x) \cos(2x) e^x & 4 \cos(x) \cos(2x) e^x \end{bmatrix} \end{aligned} \quad (31)$$

$$\begin{aligned} > \text{Aprima} := \text{ParaVar}[1] \\ & \text{Aprima} := -4 \sin(x) \cos(2x) e^x \end{aligned} \quad (32)$$

$$\begin{aligned} > \text{Bprima} := \text{ParaVar}[2] \\ & \text{Bprima} := 4 \cos(x) \cos(2x) e^x \end{aligned} \quad (33)$$

$$\begin{aligned} > AA := \text{simplify}(\text{int}(\text{Aprima}, x)) \\ & AA := -\frac{e^x (-3 \cos(3x) + \sin(3x) + 5 \cos(x) - 5 \sin(x))}{5} \end{aligned} \quad (34)$$

$$\begin{aligned} > BB := \text{simplify}(\text{int}(\text{Bprima}, x)) \\ & BB := \frac{2 e^x (6 \sin(x) \cos(x)^2 + 2 \cos(x)^3 + \sin(x) + \cos(x))}{5} \end{aligned} \quad (35)$$

$$\begin{aligned} > \text{SolGral} &:= y(x) = \text{simplify}(\text{expand}((AA + C[1]) \cdot yy[1] + (BB + C[2]) \cdot yy[2])) \\ & \text{SolGral} := y(x) = \frac{2 (-2 \cos(x)^2 + 4 \sin(x) \cos(x) + 1) (e^x)^2}{5} + (\cos(x) C_1 + \sin(x) C_2) e^x \end{aligned} \quad (36)$$

$$\begin{aligned} > \text{SolAltern} &:= y(x) = C[1] \cdot \exp(x) \cos(x) + C[2] \cdot \exp(x) \sin(x) - \frac{2}{5} \cdot \exp(2x) \cos(2x) + \frac{4}{5} \\ & \quad \cdot \exp(2x) \sin(2x) \\ & \text{SolAltern} := y(x) = e^x \cos(x) C_1 + e^x \sin(x) C_2 - \frac{2 e^{2x} \cos(2x)}{5} + \frac{4 e^{2x} \sin(2x)}{5} \end{aligned} \quad (37)$$

$$> \text{SolFinal} := y(x) = \frac{(-4 \cdot \cos(x)^2 + 8 \cdot \sin(x) \cdot \cos(x) + 2) \cdot \exp(2x)}{5} + (\cos(x) C_1$$

$$+ \sin(x) C_2) e^x$$

$$SolFinal := y(x) = \frac{(-4 \cos(x)^2 + 8 \sin(x) \cos(x) + 2) e^{2x}}{5} + (\cos(x) C_1 + \sin(x) C_2) e^x \quad (38)$$

$$\begin{aligned} &> SolFinalDos := y(x) = subs\left(\cos(x)^2 = \left(\frac{\cos(2x) + 1}{2}\right), \sin(x) \cdot \cos(x) = \frac{\sin(2x)}{2}, \right. \\ &\quad \left. rhs(SolFinal) \right) \end{aligned}$$

$$SolFinalDos := y(x) = \frac{(-2 \cos(2x) + 4 \sin(2x)) e^{2x}}{5} + (\cos(x) C_1 + \sin(x) C_2) e^x \quad (39)$$

$$\begin{aligned} &> Comprobar := simplify(eval(subs(y(x) = rhs(SolFinalDos), lhs(Ecua) - rhs(Ecua) = 0))) \\ &\quad Comprobar := 0 = 0 \quad (40) \end{aligned}$$

> restart

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