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> restart
> SolGral := y(x) = _C1·exp(−3 x) + _C2·exp(2 x) + _C3·x·exp(2 x) + 5·x·exp(−3·x) + 4
  ·cos(2 x)
  SolGral := y(x) = _C1 e−3 x + _C2 e2 x + _C3 x e2 x + 5 x e−3 x + 4 cos(2 x) (1)
> SolHom := y(x) = _C1 e−3 x + _C2 e2 x + _C3 x e2 x
  SolHom := y(x) = _C1 e−3 x + _C2 e2 x + _C3 x e2 x (2)
> SolPart := y(x) = 5 x e−3 x + 4 cos(2 x)
  SolPart := y(x) = 5 x e−3 x + 4 cos(2 x) (3)
> EcuaAlg := expand((m + 3)·(m − 2)2) = 0
  EcuaAlg := m3 − m2 − 8 m + 12 = 0 (4)
> EcuaHom := y''' − y'' − 8·y' + 12 y = 0
  EcuaHom :=  $\frac{d^3}{dx^3} y(x) - \frac{d^2}{dx^2} y(x) - 8 \frac{d}{dx} y(x) + 12 y(x) = 0$  (5)
> Q := simplify(eval(subs(y(x) = rhs(SolPart), lhs(EcuaHom))))
  Q := 125 e−3 x + 96 sin(2 x) + 64 cos(2 x) (6)
> EcuaFinal := lhs(EcuaHom) = Q
  EcuaFinal :=  $\frac{d^3}{dx^3} y(x) - \frac{d^2}{dx^2} y(x) - 8 \frac{d}{dx} y(x) + 12 y(x) = 125 e^{-3 x} + 96 \sin(2 x)$ 
  + 64 cos(2 x) (7)
> SolGral
  y(x) = _C1 e−3 x + _C2 e2 x + _C3 x e2 x + 5 x e−3 x + 4 cos(2 x) (8)
> Comprobar := simplify(eval(subs(y(x) = rhs(SolGral), lhs(EcuaFinal) − rhs(EcuaFinal)
  = 0)))
  Comprobar := 0 = 0 (9)
> restart
> Ecua := y'' − 4·y' + 5·y = 2·x2·exp(x)
  Ecua :=  $\frac{d^2}{dx^2} y(x) - 4 \frac{d}{dx} y(x) + 5 y(x) = 2 x^2 e^x$  (10)
> CondIni := y(0) = 2, D(y)(0) = 3
  CondIni := y(0) = 2, D(y)(0) = 3 (11)
> EcuaHom := lhs(Ecua) = 0
  EcuaHom :=  $\frac{d^2}{dx^2} y(x) - 4 \frac{d}{dx} y(x) + 5 y(x) = 0$  (12)
> Q := rhs(Ecua)
  Q := 2 x2 ex (13)
> EcuaCarac := m2 − 4·m + 5 = 0
  EcuaCarac := m2 − 4 m + 5 = 0 (14)
> Raiz := solve(EcuaCarac)
  Raiz := [1/2 + 3/2 i, 1/2 − 3/2 i] (15)

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$$Raiz := 2 + I, 2 - I \quad (15)$$

$$\begin{aligned} > yy[1] := \exp(\operatorname{Re}(Raiz[1]) \cdot x) \cos(\operatorname{Im}(Raiz[1]) \cdot x) \\ & \quad yy_1 := e^{2x} \cos(x) \end{aligned} \quad (16)$$

$$\begin{aligned} > yy[2] := \exp(\operatorname{Re}(Raiz[1]) \cdot x) \sin(\operatorname{Im}(Raiz[1]) \cdot x) \\ & \quad yy_2 := e^{2x} \sin(x) \end{aligned} \quad (17)$$

> with(linalg) :

$$\begin{aligned} > WW := \operatorname{wronskian}([yy[1], yy[2]], x) \\ & \quad WW := \begin{bmatrix} e^{2x} \cos(x) & e^{2x} \sin(x) \\ 2e^{2x} \cos(x) - e^{2x} \sin(x) & 2e^{2x} \sin(x) + e^{2x} \cos(x) \end{bmatrix} \end{aligned} \quad (18)$$

$$\begin{aligned} > BB := \operatorname{array}([0, Q]) \\ & \quad BB := \begin{bmatrix} 0 & 2x^2 e^x \end{bmatrix} \end{aligned} \quad (19)$$

$$\begin{aligned} > ParaVar := \operatorname{simplify}(\operatorname{linsolve}(WW, BB)) \\ & \quad ParaVar := \begin{bmatrix} -2x^2 e^{-x} \sin(x) & 2x^2 \cos(x) e^{-x} \end{bmatrix} \end{aligned} \quad (20)$$

$$\begin{aligned} > Aprima := ParaVar[1]; Bprima := ParaVar[2] \\ & \quad Aprima := -2x^2 e^{-x} \sin(x) \\ & \quad Bprima := 2x^2 \cos(x) e^{-x} \end{aligned} \quad (21)$$

$$\begin{aligned} > SolGral := y(x) = \operatorname{simplify}((\operatorname{int}(Aprima, x) + _C1) \cdot yy[1] + (\operatorname{int}(Bprima, x) + _C2) \cdot yy[2]) \\ & \quad SolGral := y(x) = e^x ((\sin(x) _C2 + \cos(x) _C1) e^x + (x+1)^2) \end{aligned} \quad (22)$$

$$\begin{aligned} > Ecua \\ & \quad \frac{d^2}{dx^2} y(x) - 4 \frac{d}{dx} y(x) + 5 y(x) = 2x^2 e^x \end{aligned} \quad (23)$$

$$\begin{aligned} > ComprobarUno := \operatorname{simplify}(\operatorname{eval}(\operatorname{subs}(y(x) = \operatorname{rhs}(SolGral), \operatorname{lhs}(Ecua) - \operatorname{rhs}(Ecua) = 0))) \\ & \quad ComprobarUno := 0 = 0 \end{aligned} \quad (24)$$

$$\begin{aligned} > CondIni \\ & \quad y(0) = 2, D(y)(0) = 3 \end{aligned} \quad (25)$$

$$\begin{aligned} > ParaUno := \operatorname{simplify}(\operatorname{subs}(x=0, \operatorname{rhs}(SolGral) = 2)) \\ & \quad ParaUno := _C1 + 1 = 2 \end{aligned} \quad (26)$$

$$\begin{aligned} > ParaDos := \operatorname{simplify}(\operatorname{subs}(x=0, \operatorname{rhs}(\operatorname{diff}(SolGral, x)) = 3)) \\ & \quad ParaDos := 2_C1 + 3 + _C2 = 3 \end{aligned} \quad (27)$$

$$\begin{aligned} > Parametros := \operatorname{solve}(\{ParaUno, ParaDos\}, \{_C1, _C2\}) \\ & \quad Parametros := \{_C1 = 1, _C2 = -2\} \end{aligned} \quad (28)$$

$$\begin{aligned} > SolPart := \operatorname{subs}(_C1 = \operatorname{rhs}(Parametros[1]), _C2 = \operatorname{rhs}(Parametros[2]), SolGral) \\ & \quad SolPart := y(x) = e^x ((-2 \sin(x) + \cos(x)) e^x + (x+1)^2) \end{aligned} \quad (29)$$

$$\begin{aligned} > ComprobarDos := \operatorname{simplify}(\operatorname{subs}(x=0, SolPart)) \\ & \quad ComprobarDos := y(0) = 2 \end{aligned} \quad (30)$$

$$\begin{aligned} > ComprobarTres := D(y)(0) = \operatorname{simplify}(\operatorname{subs}(x=0, \operatorname{rhs}(\operatorname{diff}(SolPart, x)))) \\ & \quad ComprobarTres := D(y)(0) = 3 \end{aligned} \quad (31)$$

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| > ComprobarCuatro := simplify( eval( subs( y(x) = rhs( SolPart ), lhs( Ecua ) - rhs( Ecua ) = 0 ) ) )
| =
| > ComprobarCuatro := 0 = 0 (32)

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