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> restart
> Ecua := y''' - y'' + y' - y = x^2 + x
      Ecua :=  $\frac{d^3}{dx^3} y(x) - \frac{d^2}{dx^2} y(x) + \frac{d}{dx} y(x) - y(x) = x^2 + x$  (1)
> EcuaHom := lhs(Ecua) = 0
      EcuaHom :=  $\frac{d^3}{dx^3} y(x) - \frac{d^2}{dx^2} y(x) + \frac{d}{dx} y(x) - y(x) = 0$  (2)
> Q := rhs(Ecua)
      Q :=  $x^2 + x$  (3)
> EcuaCarac := m^3 - m^2 + m - 1 = 0
      EcuaCarac :=  $m^3 - m^2 + m - 1 = 0$  (4)
> Raiz := solve(EcuaCarac)
      Raiz := 1, I, -I (5)
> yy[1] := exp(Raiz[1]·x)
      yy1 := ex (6)
> yy[2] := cos(Im(Raiz[2])·x)
      yy2 := cos(x) (7)
> yy[3] := sin(Im(Raiz[2])·x)
      yy3 := sin(x) (8)
> SolGralHom := y(x) = _C1·yy[1] + _C2·yy[2] + _C3·yy[3]
      SolGralHom :=  $y(x) = \_C1 e^x + \_C2 \cos(x) + \_C3 \sin(x)$  (9)
> SolGralNoHom := y(x) = AA·yy[1] + BB·yy[2] + DD·yy[3]
      SolGralNoHom :=  $y(x) = AA e^x + BB \cos(x) + DD \sin(x)$  (10)
> with(linalg) :
> WW := wronskian([yy[1], yy[2], yy[3]], x)
      WW :=  $\begin{bmatrix} e^x & \cos(x) & \sin(x) \\ e^x & -\sin(x) & \cos(x) \\ e^x & -\cos(x) & -\sin(x) \end{bmatrix}$  (11)
>
> QQ := array([0, 0, Q])
      QQ :=  $\begin{bmatrix} 0 & 0 & x^2 + x \end{bmatrix}$  (12)
> ParaVar := linsolve(WW, QQ) : Aprima := simplify(ParaVar[1]); Bprima :=
      simplify(ParaVar[2]); Dprima := simplify(ParaVar[3])
      Aprima :=  $\frac{x(x+1)e^{-x}}{2}$ 
      Bprima :=  $\frac{x(x+1)(\sin(x) - \cos(x))}{2}$ 

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$$Dprima := -\frac{(\cos(x) + \sin(x)) x (x + 1)}{2} \quad (13)$$

$$> IntAA := \text{int}(Aprima, x)$$

$$IntAA := -\frac{(x^2 + 3x + 3) e^{-x}}{2} \quad (14)$$

$$> IntBB := \text{simplify}(\text{int}(Bprima, x))$$

$$IntBB := \frac{(-x^2 - 3x + 1) \cos(x)}{2} - \frac{\sin(x) (x^2 - x - 3)}{2} \quad (15)$$

$$> IntDD := \text{simplify}(\text{int}(Dprima, x))$$

$$IntDD := \frac{(x^2 - x - 3) \cos(x)}{2} - \frac{\sin(x) (x^2 + 3x - 1)}{2} \quad (16)$$

$$> SolPartNoHom := y(x) = IntAA \cdot yy[1] + IntBB \cdot yy[2] + IntDD \cdot yy[3]$$

$$SolPartNoHom := y(x) = -\frac{(x^2 + 3x + 3) e^{-x} e^x}{2} + \left(\frac{(-x^2 - 3x + 1) \cos(x)}{2} - \frac{\sin(x) (x^2 - x - 3)}{2} \right) \cos(x) + \left(\frac{(x^2 - x - 3) \cos(x)}{2} - \frac{\sin(x) (x^2 + 3x - 1)}{2} \right) \sin(x) \quad (17)$$

$$> SolPartDos := y(x) = \text{simplify}(\text{rhs}(SolPartNoHom))$$

$$SolPartDos := y(x) = -x^2 - 3x - 1 \quad (18)$$

$$> SolGralHom := y(x) = _C1 \cdot yy[1] + _C2 \cdot yy[2] + _C3 \cdot yy[3]$$

$$SolGralHom := y(x) = _C1 e^x + _C2 \cos(x) + _C3 \sin(x) \quad (19)$$

$$> SolGralNoHom := y(x) = \text{rhs}(SolGralHom) + \text{rhs}(SolPartDos)$$

$$SolGralNoHom := y(x) = _C1 e^x + _C2 \cos(x) + _C3 \sin(x) - x^2 - 3x - 1 \quad (20)$$

$$> \text{restart}$$

$$> Ecua := y'' - 6 \cdot y' + 9y = 25 \cdot \exp(x) \cdot \sin(x)$$

$$Ecua := \frac{d^2}{dx^2} y(x) - 6 \frac{d}{dx} y(x) + 9y(x) = 25 e^x \sin(x) \quad (21)$$

$$> EcuaHom := \text{lhs}(Ecua) = 0$$

$$EcuaHom := \frac{d^2}{dx^2} y(x) - 6 \frac{d}{dx} y(x) + 9y(x) = 0 \quad (22)$$

$$> Q := \text{rhs}(Ecua)$$

$$Q := 25 e^x \sin(x) \quad (23)$$

$$> EcuaCarac := m^2 - 6 \cdot m + 9 = 0$$

$$EcuaCarac := m^2 - 6m + 9 = 0 \quad (24)$$

$$> Raiz := \text{solve}(EcuaCarac)$$

$$Raiz := 3, 3 \quad (25)$$

$$> yy[1] := \exp(Raiz[1] \cdot x); yy[2] := x \cdot \exp(Raiz[1] \cdot x)$$

$$\begin{aligned} yy_1 &:= e^{3x} \\ yy_2 &:= x e^{3x} \end{aligned} \quad (26)$$

> with(linalg) :

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

$$WW := \begin{bmatrix} e^{3x} & x e^{3x} \\ 3 e^{3x} & e^{3x} + 3 x e^{3x} \end{bmatrix} \quad (27)$$

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

$$BB := \begin{bmatrix} 0 & 25 e^x \sin(x) \end{bmatrix} \quad (28)$$

> ParaVar := linsolve(WW, BB)

$$ParaVar := \begin{bmatrix} -\frac{25 x e^x \sin(x)}{e^{3x}} & \frac{25 e^x \sin(x)}{e^{3x}} \end{bmatrix} \quad (29)$$

> Aprima := simplify(ParaVar[1]); Bprima := simplify(ParaVar[2])

$$\begin{aligned} Aprima &:= -25 \sin(x) x e^{-2x} \\ Bprima &:= 25 \sin(x) e^{-2x} \end{aligned} \quad (30)$$

> SolPart := y(x) = simplify(int(Aprima, x) · yy[1] + int(Bprima, x) · yy[2])

$$SolPart := y(x) = (4 \cos(x) + 3 \sin(x)) e^x \quad (31)$$

> SolGralHom := y(x) = _C1 · yy[1] + _C2 · yy[2]

$$SolGralHom := y(x) = _C1 e^{3x} + _C2 x e^{3x} \quad (32)$$

> SolGralNoHom := y(x) = rhs(SolGralHom) + rhs(SolPart)

$$SolGralNoHom := y(x) = _C1 e^{3x} + _C2 x e^{3x} + (4 \cos(x) + 3 \sin(x)) e^x \quad (33)$$

> EcuaHom

$$\frac{d^2}{dx^2} y(x) - 6 \frac{d}{dx} y(x) + 9 y(x) = 0 \quad (34)$$

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

$$Comprobar := 25 e^x \sin(x) = 25 e^x \sin(x) \quad (35)$$

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