

```

> restart
> Ecua := y'' - 5·y' + 6·y = 3·exp(4 x)
      Ecua :=  $\frac{d^2}{dx^2} y(x) - 5 \frac{d}{dx} y(x) + 6 y(x) = 3 e^{4x}$  (1)
> EcuaHom := lhs(Ecua) = 0
      EcuaHom :=  $\frac{d^2}{dx^2} y(x) - 5 \frac{d}{dx} y(x) + 6 y(x) = 0$  (2)
> Q := rhs(Ecua)
      Q :=  $3 e^{4x}$  (3)
> EcuaCarac := m2 - 5·m + 6 = 0
      EcuaCarac :=  $m^2 - 5 m + 6 = 0$  (4)
> Raiz := solve(EcuaCarac)
      Raiz := 3, 2 (5)
> yy[1] := exp(Raiz[1]·x); yy[2] := exp(Raiz[2]·x)
      yy1 := e3x
      yy2 := e2x (6)
> SolHom := y(x) = _C1·yy[1] + _C2·yy[2]
      SolHom :=  $y(x) = \_C1 e^{3x} + \_C2 e^{2x}$  (7)
> SolNoHom := y(x) = A·yy[1] + B·yy[2]
      SolNoHom :=  $y(x) = A e^{3x} + B e^{2x}$  (8)
> with(linalg) :
> WW := wronskian([yy[1], yy[2]], x)
      WW :=  $\begin{bmatrix} e^{3x} & e^{2x} \\ 3 e^{3x} & 2 e^{2x} \end{bmatrix}$  (9)
> BB := array([0, Q])
      BB :=  $\begin{bmatrix} 0 & 3 e^{4x} \end{bmatrix}$  (10)
> Parametros := linsolve(WW, BB)
      Parametros :=  $\begin{bmatrix} \frac{3 e^{4x}}{e^{3x}} & -\frac{3 e^{4x}}{e^{2x}} \end{bmatrix}$  (11)
> Aprima := Parametros[1]; Bprima := Parametros[2]
      Aprima :=  $\frac{3 e^{4x}}{e^{3x}}$ 
      Bprima :=  $-\frac{3 e^{4x}}{e^{2x}}$  (12)
> A := int(Aprima, x) + _C1; B := int(Bprima, x) + _C2
      A :=  $\frac{3 e^{4x}}{e^{3x}} + \_C1$ 

```

$$B := -\frac{3 e^{4x}}{2 e^{2x}} + _C2 \quad (13)$$

> *SolFinal* := simplify(*SolNoHom*)

$$\text{SolFinal} := y(x) = \frac{3 e^{4x}}{2} + _C1 e^{3x} + _C2 e^{2x} \quad (14)$$

> restart

> *Ecua* := y'' + 4·y = sin(x)·sin(2·x)

$$\text{Ecua} := \frac{d^2}{dx^2} y(x) + 4 y(x) = \sin(x) \sin(2 x) \quad (15)$$

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

$$\text{EcuaHom} := \frac{d^2}{dx^2} y(x) + 4 y(x) = 0 \quad (16)$$

> *Q* := rhs(*Ecua*)

$$Q := \sin(x) \sin(2 x) \quad (17)$$

> *EcuaCarac* := $m^2 + 4 = 0$

$$\text{EcuaCarac} := m^2 + 4 = 0 \quad (18)$$

> *Raiz* := solve(*EcuaCarac*)

$$\text{Raiz} := 2 I, -2 I \quad (19)$$

> *yy*[1] := cos(Im(*Raiz*[1])·x)

$$yy_1 := \cos(2 x) \quad (20)$$

> *yy*[2] := sin(Im(*Raiz*[1])·x)

$$yy_2 := \sin(2 x) \quad (21)$$

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

$$\text{SolHom} := y(x) = _C1 \cos(2 x) + _C2 \sin(2 x) \quad (22)$$

> *SolNoHom* := y(x) = A·yy[1] + B·yy[2]

$$\text{SolNoHom} := y(x) = A \cos(2 x) + B \sin(2 x) \quad (23)$$

> with(linalg) :

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

$$WW := \begin{bmatrix} \cos(2 x) & \sin(2 x) \\ -2 \sin(2 x) & 2 \cos(2 x) \end{bmatrix} \quad (24)$$

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

$$BB := \begin{bmatrix} 0 & \sin(x) \sin(2 x) \end{bmatrix} \quad (25)$$

> *Para* := linsolve(*WW*, *BB*)

$$\text{Para} := \begin{bmatrix} -\frac{\sin(2 x)^2 \sin(x)}{2 (\sin(2 x)^2 + \cos(2 x)^2)} & \frac{\cos(2 x) \sin(x) \sin(2 x)}{2 (\sin(2 x)^2 + \cos(2 x)^2)} \end{bmatrix} \quad (26)$$

> *Aprima* := simplify(*Para*[1])

$$\text{Aprima} := -\frac{\sin(2 x)^2 \sin(x)}{2} \quad (27)$$

> *Bprima* := simplify(*Para*[2])

$$Bprima := \frac{\cos(2x) \sin(x) \sin(2x)}{2} \quad (28)$$

$$> A := \text{int}(Aprima, x) + _C1$$

$$A := \frac{\cos(x)}{4} + \frac{\cos(3x)}{24} - \frac{\cos(5x)}{40} + _C1 \quad (29)$$

$$> B := \text{int}(Bprima, x) + _C2$$

$$B := \frac{\sin(3x)}{24} - \frac{\sin(5x)}{40} + _C2 \quad (30)$$

$$> SolFinal := \text{simplify}(SolNoHom)$$

$$SolFinal := y(x) = 2_C1 \cos(x)^2 + 2_C2 \sin(x) \cos(x) + \frac{2 \cos(x)^3}{5} - _C1 - \frac{2 \cos(x)}{15} \quad (31)$$

$$> ComprobarUno := \text{subs}(y(x) = \text{rhs}(SolFinal), Ecua)$$

$$ComprobarUno := \frac{\partial^2}{\partial x^2} \left(2_C1 \cos(x)^2 + 2_C2 \sin(x) \cos(x) + \frac{2 \cos(x)^3}{5} - _C1 - \frac{2 \cos(x)}{15} \right) + 8_C1 \cos(x)^2 + 8_C2 \sin(x) \cos(x) + \frac{8 \cos(x)^3}{5} - 4_C1 - \frac{8 \cos(x)}{15} = \sin(x) \sin(2x) \quad (32)$$

$$> ComprobarDos := \text{eval}(\text{subs}(y(x) = \text{rhs}(SolFinal), Ecua))$$

$$ComprobarDos := 4_C1 \sin(x)^2 + 4_C1 \cos(x)^2 + \frac{2 \cos(x)^3}{5} + \frac{12 \sin(x)^2 \cos(x)}{5} - \frac{2 \cos(x)}{5} - 4_C1 = \sin(x) \sin(2x) \quad (33)$$

$$> ComprobarTres := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(SolFinal), Ecua)))$$

$$ComprobarTres := 2 \sin(x)^2 \cos(x) = \sin(x) \sin(2x) \quad (34)$$

>

$$> ComprobarCuatro := \text{subs}(\sin(2 \cdot x) = 2 \cdot \sin(x) \cdot \cos(x), \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(SolFinal), Ecua))))$$

$$ComprobarCuatro := 2 \sin(x)^2 \cos(x) = 2 \sin(x)^2 \cos(x) \quad (35)$$

>