

$$\begin{aligned}
&> \text{restart} \\
&> \text{SolGral} := y(x) = _C1 \cdot \exp(2 \cdot x) + _C2 \cdot \exp(-2 \cdot x) \\
&\quad \text{SolGral} := y(x) = _C1 e^{2x} + _C2 e^{-2x} \tag{1} \\
&= \\
&> \text{EcuaCarac} := \text{expand}((m+2) \cdot (m-2)) = 0 \\
&\quad \text{EcuaCarac} := m^2 - 4 = 0 \tag{2} \\
&= \\
&> \text{Ecua} := y'' - 4 \cdot y = 0 \\
&\quad \text{Ecua} := \frac{d^2}{dx^2} y(x) - 4 y(x) = 0 \tag{3} \\
&= \\
&> \text{comprobar} := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{SolGral}), \text{Ecua}))) \\
&\quad \text{comprobar} := 0 = 0 \tag{4} \\
&= \\
&> \text{restart} \\
&> \text{SolGral} := y(x) = _C1 \cdot \cos(4 \cdot x) + _C2 \cdot \sin(4 \cdot x) + _C3 \cdot x \cdot \cos(4 \cdot x) + _C4 \cdot x \cdot \sin(4 \cdot x) \\
&\quad \text{SolGral} := y(x) = _C1 \cos(4x) + _C2 \sin(4x) + _C3 x \cos(4x) + _C4 x \sin(4x) \tag{5} \\
&= \\
&> \text{EcuaCarac} := \text{expand}(((m-4I) \cdot (m+4I))^2) = 0 \\
&\quad \text{EcuaCarac} := m^4 + 32m^2 + 256 = 0 \tag{6} \\
&= \\
&> \text{Ecua} := y'''' + 32 \cdot y'' + 256 \cdot y = 0 \\
&\quad \text{Ecua} := \frac{d^4}{dx^4} y(x) + 32 \frac{d^2}{dx^2} y(x) + 256 y(x) = 0 \tag{7} \\
&= \\
&> \text{SolFinal} := \text{dsolve}(\text{Ecua}) \\
&\quad \text{SolFinal} := y(x) = c_1 \sin(4x) + c_2 \cos(4x) + c_3 \sin(4x)x + c_4 \cos(4x)x \tag{8} \\
&= \\
&> \text{restart} \\
&> \text{SolGral} := y(x) = \exp(2 \cdot x) \cdot (_C1 + _C2 \cdot \cos(x) + _C3 \cdot \sin(x)) \\
&\quad \text{SolGral} := y(x) = e^{2x} (_C1 + _C2 \cos(x) + _C3 \sin(x)) \tag{9} \\
&= \\
&> \text{EcuaCarac} := (m-2) \cdot (m-(2-I)) \cdot (m-(2+I)) = 0 \\
&\quad \text{EcuaCarac} := (m-2)(m-2+I)(m-2-I) = 0 \tag{10} \\
&= \\
&> \text{EcuaCaracDos} := \text{expand}(\text{lhs}(\text{EcuaCarac})) = 0 \\
&\quad \text{EcuaCaracDos} := m^3 - 6m^2 + 13m - 10 = 0 \tag{11} \\
&= \\
&> \text{Ecua} := y''' - 6 \cdot y'' + 13 \cdot y' - 10 \cdot y = 0 \\
&\quad \text{Ecua} := \frac{d^3}{dx^3} y(x) - 6 \frac{d^2}{dx^2} y(x) + 13 \frac{d}{dx} y(x) - 10 y(x) = 0 \tag{12} \\
&= \\
&> \text{SolFinal} := \text{dsolve}(\text{Ecua}) \\
&\quad \text{SolFinal} := y(x) = c_1 e^{2x} + c_2 e^{2x} \sin(x) + c_3 e^{2x} \cos(x) \tag{13} \\
&= \\
&> \text{restart} \\
&> \text{restart} \\
&> \text{Ecua} := y''' + 6 \cdot y'' + 11 \cdot y' + 6 \cdot y = 0 \\
&\quad \text{Ecua} := \frac{d^3}{dx^3} y(x) + 6 \frac{d^2}{dx^2} y(x) + 11 \frac{d}{dx} y(x) + 6 y(x) = 0 \tag{14} \\
&= \\
&> \text{EcuaCarac} := m^3 + 6 \cdot m^2 + 11 \cdot m + 6 = 0 \tag{15}
\end{aligned}$$

$$EcuaCarac := m^3 + 6 m^2 + 11 m + 6 = 0 \quad (15)$$

> Raiz := solve(EcuaCarac)

$$Raiz := -3, -2, -1 \quad (16)$$

> SolGral := y(x) = _C1·exp(-3·x) + _C2·exp(-2·x) + _C3·exp(-x)

$$SolGral := y(x) = _C1 e^{-3x} + _C2 e^{-2x} + _C3 e^{-x} \quad (17)$$

> dsolve(Ecua)

$$y(x) = c_1 e^{-2x} + c_2 e^{-3x} + c_3 e^{-x} \quad (18)$$

> restart

> Ecua := y''' - 3·y'' + 3·y' - y = 0

$$Ecua := \frac{d^3}{dx^3} y(x) - 3 \frac{d^2}{dx^2} y(x) + 3 \frac{d}{dx} y(x) - y(x) = 0 \quad (19)$$

> EcuaCarac := m^3 - 3·m^2 + 3·m - 1 = 0

$$EcuaCarac := m^3 - 3 m^2 + 3 m - 1 = 0 \quad (20)$$

> Raiz := solve(EcuaCarac)

$$Raiz := 1, 1, 1 \quad (21)$$

> yy[1] := exp(Raiz[1]·x)

$$yy_1 := e^x \quad (22)$$

> yy[2] := x·exp(Raiz[1]·x)

$$yy_2 := x e^x \quad (23)$$

> yy[3] := x^2·exp(Raiz[1]·x)

$$yy_3 := x^2 e^x \quad (24)$$

> SolGral := y(x) = _C1·yy[1] + _C2·yy[2] + _C3·yy[3]

$$SolGral := y(x) = _C1 e^x + _C2 x e^x + _C3 x^2 e^x \quad (25)$$

> CondIni := y(0) = 1, y'(0) = 2, y''(0) = 3

$$CondIni := y(0) = 1, D(y)(0) = 2, D^{(2)}(y)(0) = 3 \quad (26)$$

> Sistema := simplify(subs(x=0, rhs(SolGral) = 1)), simplify(subs(x=0, rhs(diff(SolGral, x)) = 2)), simplify(subs(x=0, rhs(diff(SolGral, x\$2)) = 3)) :

> Sistema[1]; Sistema[2]; Sistema[3]

$$\begin{aligned} _C1 &= 1 \\ _C1 + _C2 &= 2 \\ _C1 + 2 _C2 + 2 _C3 &= 3 \end{aligned} \quad (27)$$

> Param := solve([Sistema])

$$Param := \{ _C1 = 1, _C2 = 1, _C3 = 0 \} \quad (28)$$

> SolPart := subs(_C1 = rhs(Param[1]), _C2 = rhs(Param[2]), _C3 = rhs(Param[3]), SolGral)

$$SolPart := y(x) = e^x + x e^x \quad (29)$$

> ComprobarUno := simplify(subs(x=0, SolPart))

$$ComprobarUno := y(0) = 1 \quad (30)$$

> ComprobarDos := D(y)(0) = simplify(subs(x=0, rhs(diff(SolPart, x))))

$$ComprobarDos := D(y)(0) = 2 \quad (31)$$

$$\begin{aligned} & \text{ComprobarTres} := D(D(y))(0) = \text{simplify}(\text{subs}(x=0, \text{rhs}(\text{diff}(\text{SolPart}, x\$2)))) \\ & \text{ComprobarTres} := D^{(2)}(y)(0) = 3 \end{aligned} \quad (32)$$

$$ComprobarTres := D^{(2)}(y)(0) = 3 \quad (32)$$

$$\begin{aligned} &> \text{CondIni} \\ &\quad y(0) = 1, D(y)(0) = 2, D^{(2)}(y)(0) = 3 \end{aligned} \tag{33}$$

$$y(0) = 1, D(y)(0) = 2, D^{(2)}(y)(0) = 3 \quad (33)$$

$$\begin{aligned} & \textcolor{red}{>} \textit{ComprobarCuatro} := \textit{simplify}(\textit{eval}(\textit{subs}(y(x) = \textit{rhs}(\textit{SolGral}), \textit{Ecua}))) \\ & \textcolor{blue}{\textit{ComprobarCuatro} := 0 = 0} \end{aligned} \tag{34}$$

$$\textit{ComprobarCuatro} := 0 = 0 \tag{34}$$

$$\begin{aligned} & \textcolor{red}{\triangleright} \textit{ComprobarCinco} := \textit{simplify}(\textit{eval}(\textit{subs}(y(x) = \textit{rhs}(\textit{SolPart}), \textit{Ecu}))) \\ & \textcolor{blue}{\textit{ComprobarCinco}} := 0 = 0 \end{aligned} \tag{35}$$

$$\textit{ComprobarCinco} := 0 = 0 \tag{35}$$

```
> restart
```

>