

> restart
 > Sistema := diff(x₁(t), t) = 2 x₁(t) + 3 x₂(t) + 4 exp(2 t), diff(x₂(t), t) = x₁(t) + 4 x₂(t) + 8 t : Sistema₁; Sistema₂;

$$\begin{aligned} \frac{d}{dt} x_1(t) &= 2 x_1(t) + 3 x_2(t) + 4 e^{2t} \\ \frac{d}{dt} x_2(t) &= x_1(t) + 4 x_2(t) + 8 t \end{aligned} \quad (1)$$

> SolGeneral := dsolve({Sistema}) : SolGeneral₁; SolGeneral₂;

$$\begin{aligned} x_1(t) &= e^{5t} _C2 - 3 e^t _C1 + \frac{144}{25} + \frac{8}{3} e^{2t} + \frac{24}{5} t \\ x_2(t) &= e^{5t} _C2 + e^t _C1 - \frac{56}{25} - \frac{16}{5} t - \frac{4}{3} e^{2t} \end{aligned} \quad (2)$$

> Ecuacion := diff(xx₂(t), t\$2) - 6 diff(xx₂(t), t) + 5 xx₂(t) = 4 exp(2 t) - 16 t + 8;

$$Ecuacion := \frac{d^2}{dt^2} xx_2(t) - 6 \left(\frac{d}{dt} xx_2(t) \right) + 5 xx_2(t) = 4 e^{2t} - 16 t + 8 \quad (3)$$

> EcuacionHom := lhs(Ecuacion) = 0

$$EcuacionHom := \frac{d^2}{dt^2} xx_2(t) - 6 \left(\frac{d}{dt} xx_2(t) \right) + 5 xx_2(t) = 0 \quad (4)$$

> Q := rhs(Ecuacion)

$$Q := 4 e^{2t} - 16 t + 8 \quad (5)$$

> EcuaCarac := m · 2 - 6 m + 5 = 0

$$EcuaCarac := m^2 - 6 m + 5 = 0 \quad (6)$$

> Raiz := solve(EcuaCarac)

$$Raiz := 5, 1 \quad (7)$$

> Sol₁ := xx₂(t) = exp(Raiz₁ · t); Sol₂ := xx₂(t) = exp(Raiz₂ · t)

$$\begin{aligned} Sol_1 &:= xx_2(t) = e^{5t} \\ Sol_2 &:= xx_2(t) = e^t \end{aligned} \quad (8)$$

> with(linalg) :

> WW := wronskian([rhs(Sol₁), rhs(Sol₂)], t)

$$WW := \begin{bmatrix} e^{5t} & e^t \\ 5 e^{5t} & e^t \end{bmatrix} \quad (9)$$

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

$$BB := \begin{bmatrix} 0 & 4 e^{2t} - 16 t + 8 \end{bmatrix} \quad (10)$$

> SOL := linsolve(WW, BB)

$$SOL := \begin{bmatrix} \frac{2 + e^{2t} - 4 t}{e^{5t}} & - \frac{2 + e^{2t} - 4 t}{e^t} \end{bmatrix} \quad (11)$$

> Aprima := SOL₁; Bprima := SOL₂;

$$\begin{aligned} \text{Aprima} &:= \frac{2 + e^{2t} - 4t}{e^{5t}} \\ \text{Bprima} &:= -\frac{2 + e^{2t} - 4t}{e^t} \end{aligned} \quad (12)$$

> $A := \text{simplify}(\text{int}(\text{Aprima}, t) + C_1); B := \text{simplify}(\text{int}(\text{Bprima}, t) + C_2);$

$$\begin{aligned} A &:= -\frac{6}{25} e^{-5t} + \frac{4}{5} e^{-5t} t - \frac{1}{3} e^{-3t} + C_1 \\ B &:= -2 e^{-t} - 4 e^{-t} t - e^t + C_2 \end{aligned} \quad (13)$$

> $\text{SolGralDos} := \text{xx}_2(t) = \text{simplify}(A \cdot \text{rhs}(\text{Sol}_1) + B \cdot \text{rhs}(\text{Sol}_2))$

$$\text{SolGralDos} := \text{xx}_2(t) = -\frac{56}{25} - \frac{16}{5} t - \frac{4}{3} e^{2t} + e^{5t} C_1 + e^t C_2 \quad (14)$$

> $\text{SolGralUno} := \text{xx}_1(t) = \text{simplify}(\text{rhs}(\text{diff}(\text{SolGralDos}, t)) - 4 \cdot \text{rhs}(\text{SolGralDos}) - 8 t)$

$$\text{SolGralUno} := \text{xx}_1(t) = \frac{144}{25} + \frac{8}{3} e^{2t} + e^{5t} C_1 - 3 e^t C_2 + \frac{24}{5} t \quad (15)$$

> $\text{SolGeneral}_1; \text{SolGeneral}_2;$

$$\begin{aligned} x_1(t) &= e^{5t} C_2 - 3 e^t C_1 + \frac{144}{25} + \frac{8}{3} e^{2t} + \frac{24}{5} t \\ x_2(t) &= e^{5t} C_2 + e^t C_1 - \frac{56}{25} - \frac{16}{5} t - \frac{4}{3} e^{2t} \end{aligned} \quad (16)$$

> restart

>

$$\frac{d^3 y(t)}{dt^3} - 4 \frac{d^2 y(t)}{dt^2} + 6 \frac{dy(t)}{dt} - 8 y(t) = 6 \cos(3t)$$

> $\text{Ecuacion} := \text{diff}(y(t), t^3) - 4 \text{diff}(y(t), t^2) + 6 \text{diff}(y(t), t) - 8 y(t) = 0$

$$\text{Ecuacion} := \frac{d^3}{dt^3} y(t) - 4 \left(\frac{d^2}{dt^2} y(t) \right) + 6 \left(\frac{d}{dt} y(t) \right) - 8 y(t) = 0 \quad (17)$$

> $\text{Condicion} := y(0) = 1, D(y)(0) = 2, D(D(y))(0) = 3;$

$$\text{Condicion} := y(0) = 1, D(y)(0) = 2, D^{(2)}(y)(0) = 3 \quad (18)$$

> $\text{SolucionParticular} := \text{dsolve}(\{\text{Ecuacion}, \text{Condicion}\}) : \text{evalf}(\%, 2)$

$$y(t) = 0.49 e^{2.8t} + 0.23 e^{0.58t} \sin(1.5t) + 0.56 e^{0.58t} \cos(1.5t) \quad (19)$$

> $\text{Sistema} := \text{diff}(yy_1(t), t) = yy_2(t), \text{diff}(yy_2(t), t) = yy_3(t), \text{diff}(yy_3(t), t) = 8 yy_1(t) - 6 yy_2(t) + 4 yy_3(t) : \text{Sistema}_1; \text{Sistema}_2; \text{Sistema}_3$

$$\frac{d}{dt} yy_1(t) = yy_2(t)$$

$$\frac{d}{dt} yy_2(t) = yy_3(t)$$

(20)

$$\frac{d}{dt} yy_3(t) = 8 yy_1(t) - 6 yy_2(t) + 4 yy_3(t) \quad (20)$$

> Condiciones := yy₁(0) = 1, yy₂(0) = 2, yy₃(0) = 3;

$$\text{Condiciones} := yy_1(0) = 1, yy_2(0) = 2, yy_3(0) = 3 \quad (21)$$

> SolGral := simplify(dsolve({Sistema, Condiciones})) : evalf(SolGral₁, 2); evalf(SolGral₂, 2); evalf(SolGral₃, 2)

$$yy_1(t) = 0.59 e^{0.54t} \cos(1.6t) + 0.29 e^{0.54t} \sin(1.6t) + 0.46 e^{2.9t}$$

$$yy_2(t) = 0.78 e^{0.54t} \cos(1.6t) - 0.78 e^{0.54t} \sin(1.6t) + 1.4 e^{2.9t}$$

$$yy_3(t) = -1.5 e^{0.58t} \sin(1.6t) - 0.85 e^{0.58t} \cos(1.6t) + 3.7 e^{2.9t} \quad (22)$$

> plot([rhs(SolGral₁), rhs(SolGral₂), rhs(SolGral₃)], t=0..0.5, y=0..16, color=[red, blue, brown])



