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

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> SolGeneral := dsolve({Sistema}) : SolGeneral1; SolGeneral2;
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$$\begin{aligned}x_1(t) &= e^{5t} C_2 - 3 e^t C_1 + \frac{144}{25} + \frac{8}{3} e^{2t} + \frac{24}{5} t \\ x_2(t) &= e^{5t} C_2 + e^t C_1 - \frac{56}{25} - \frac{16}{5} t - \frac{4}{3} e^{2t}\end{aligned}\quad (2)$$

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> Ecuacion := diff(xx2(t), t$2) - 6 diff(xx2(t), t) + 5 xx2(t) = 4 exp(2 t) - 16 t + 8;
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$$Ecuacion := \frac{d^2}{dt^2} xx_2(t) - 6 \left( \frac{d}{dt} xx_2(t) \right) + 5 xx_2(t) = 4 e^{2t} - 16 t + 8 \quad (3)$$

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

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

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

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

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> Sol1 := xx2(t) = exp(Raiz1·t); Sol2 := xx2(t) = exp(Raiz2·t)
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$$\begin{aligned}Sol_1 &:= xx_2(t) = e^{5t} \\ Sol_2 &:= xx_2(t) = e^t\end{aligned}\quad (8)$$

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> with(linalg) :
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> WW := wronskian([rhs(Sol1), rhs(Sol2)], t)
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$$WW := \begin{bmatrix} e^{5t} & e^t \\ 5 e^{5t} & e^t \end{bmatrix} \quad (9)$$

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

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

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> Aprima := SOL1; Bprima := SOL2;
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$$Aprima := \frac{2 + e^{2t} - 4t}{e^{5t}}$$

$$Bprima := -\frac{2 + e^{2t} - 4t}{e^t} \quad (12)$$

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

$$A := -\frac{6}{25} e^{-5t} + \frac{4}{5} e^{-5t} t - \frac{1}{3} e^{-3t} + C_1$$

$$B := -2 e^{-t} - 4 e^{-t} t - e^t + C_2 \quad (13)$$

$$> SolGralDos := xx_2(t) = \text{simplify}(A \cdot rhs(Sol_1) + B \cdot rhs(Sol_2))$$

$$SolGralDos := xx_2(t) = -\frac{56}{25} - \frac{16}{5} t - \frac{4}{3} e^{2t} + e^{5t} C_1 + e^t C_2 \quad (14)$$

$$> SolGralUno := xx_1(t) = \text{simplify}(rhs(\text{diff}(SolGralDos, t)) - 4 \cdot rhs(SolGralDos) - 8t)$$

$$SolGralUno := xx_1(t) = \frac{144}{25} + \frac{8}{3} e^{2t} + e^{5t} C_1 - 3 e^t C_2 + \frac{24}{5} t \quad (15)$$

$$> SolGeneral_1; SolGeneral_2;$$

$$x_1(t) = e^{5t} C_2 - 3 e^t C_1 + \frac{144}{25} + \frac{8}{3} e^{2t} + \frac{24}{5} t$$

$$x_2(t) = e^{5t} C_2 + e^t C_1 - \frac{56}{25} - \frac{16}{5} t - \frac{4}{3} e^{2t} \quad (16)$$

> restart

>

$$\frac{d^3 y(t)}{dt^3} - 4 \frac{d^2 y(t)}{dt^2} + 6 \frac{dy(t)}{dt} - 8 y(t) = 6 \cos(1.5t)$$

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

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

$$> Condicion := y(0) = 1, D(y)(0) = 2, D(D(y))(0) = 3;$$

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

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

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

$$> Sistema := \text{diff}(yy_1(t), t) = yy_2(t), \text{diff}(yy_2(t), t) = yy_3(t), \text{diff}(yy_3(t), t) = 8 yy_1(t) - 6 yy_2(t) + 4 yy_3(t) : Sistema_1; Sistema_2; Sistema_3$$

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

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

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

> Condiciones := yy<sub>1</sub>(0) = 1, yy<sub>2</sub>(0) = 2, yy<sub>3</sub>(0) = 3;

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

> SolGral := simplify(dsolve( {Sistema, Condiciones} )) : evalf( SolGral<sub>1</sub>, 2); evalf( SolGral<sub>2</sub>, 2); evalf( SolGral<sub>3</sub>, 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( SolGral<sub>1</sub>), rhs( SolGral<sub>2</sub>), rhs( SolGral<sub>3</sub> )], t=0..0.5, y=0..16, color=[red, blue, brown])



