

$$\begin{aligned} &> \text{restart} \\ &> \text{Ecuacion} := \text{diff}(y(x), x\$2) - 5 \text{diff}(y(x), x) + 6 y(x) = 16 \exp(4 x) \\ &\quad \text{Ecuacion} := \frac{d^2}{dx^2} y(x) - 5 \left(\frac{d}{dx} y(x) \right) + 6 y(x) = 16 e^{4x} \end{aligned} \quad (1)$$

$$\begin{aligned} &> \text{SolucionGeneral} := \text{dsolve}(\text{Ecuacion}) \\ &\quad \text{SolucionGeneral} := y(x) = e^{3x} _C2 + e^{2x} _C1 + 8 e^{4x} \end{aligned} \quad (2)$$

$$\begin{aligned} &> \text{restart} \\ &> \text{AA} := \text{array}([[2, 3], [1, 4]]) \\ &\quad \text{AA} := \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} \end{aligned} \quad (3)$$

$$\begin{aligned} &> \text{Sistema} := \text{diff}(x_1(t), t) = 2 x_1(t) + 3 x_2(t) + 3 \exp(-3 t), \text{diff}(x_2(t), t) = x_1(t) + 4 x_2(t) + t \\ &\quad \cdot 2 : \text{Sistema}_1; \text{Sistema}_2; \\ &\quad \frac{d}{dt} x_1(t) = 2 x_1(t) + 3 x_2(t) + 3 e^{-3t} \\ &\quad \frac{d}{dt} x_2(t) = x_1(t) + 4 x_2(t) + t^2 \end{aligned} \quad (4)$$

$$\begin{aligned} &> \text{Btau} := \text{array}([3 \exp(-3 \text{tau}), \text{tau} \cdot 2]) \\ &\quad \text{Btau} := \begin{bmatrix} 3 e^{-3\tau} & \tau^2 \end{bmatrix} \end{aligned} \quad (5)$$

$$\begin{aligned} &> \text{Xinicials} := \text{array}([8, -8]) \\ &\quad \text{Xinicials} := \begin{bmatrix} 8 & -8 \end{bmatrix} \end{aligned} \quad (6)$$

$$\begin{aligned} &> \text{with}(\text{linalg}) : \\ &> \text{MatExp} := \text{exponential}(\text{AA}, t) \\ &\quad \text{MatExp} := \begin{bmatrix} \frac{3}{4} e^t + \frac{1}{4} e^{5t} & \frac{3}{4} e^{5t} - \frac{3}{4} e^t \\ \frac{1}{4} e^{5t} - \frac{1}{4} e^t & \frac{1}{4} e^t + \frac{3}{4} e^{5t} \end{bmatrix} \end{aligned} \quad (7)$$

$$\begin{aligned} &> \text{MatExpTau} := \text{exponential}(\text{AA}, t - \text{tau}) \\ &\quad \text{MatExpTau} := \begin{bmatrix} \frac{3}{4} e^{t-\tau} + \frac{1}{4} e^{5t-5\tau} & \frac{3}{4} e^{5t-5\tau} - \frac{3}{4} e^{t-\tau} \\ \frac{1}{4} e^{5t-5\tau} - \frac{1}{4} e^{t-\tau} & \frac{1}{4} e^{t-\tau} + \frac{3}{4} e^{5t-5\tau} \end{bmatrix} \end{aligned} \quad (8)$$

$$\begin{aligned} &> \text{ProdMatBB} := \text{evalm}(\text{MatExpTau} \&* \text{Btau}) : \text{ProdMatBB}_1; \text{ProdMatBB}_2; \\ &\quad 3 \left(\frac{3}{4} e^{t-\tau} + \frac{1}{4} e^{5t-5\tau} \right) e^{-3\tau} + \left(\frac{3}{4} e^{5t-5\tau} - \frac{3}{4} e^{t-\tau} \right) \tau^2 \\ &\quad 3 \left(\frac{1}{4} e^{5t-5\tau} - \frac{1}{4} e^{t-\tau} \right) e^{-3\tau} + \left(\frac{1}{4} e^{t-\tau} + \frac{3}{4} e^{5t-5\tau} \right) \tau^2 \end{aligned} \quad (9)$$

$$\begin{aligned} &> \text{IntProdMatBB} := \text{simplify}(\text{map}(\text{int}, \text{ProdMatBB}, \text{tau} = 0 .. t)) : \text{IntProdMatBB}_1; \\ &\quad \text{IntProdMatBB}_2; \end{aligned}$$

$$\begin{aligned} & \frac{3}{4000} (-1250 e^{4t} + 141 e^{8t} - 875 + 800 t^2 e^{3t} + 1920 t e^{3t} + 1984 e^{3t}) e^{-3t} \\ & - \frac{1}{4000} (-423 e^{8t} - 1250 e^{4t} - 375 + 1600 t^2 e^{3t} + 2240 t e^{3t} + 2048 e^{3t}) e^{-3t} \end{aligned} \quad (10)$$

$$\begin{aligned} & > \text{simplify}(\text{subs}(t=0, \text{IntProdMatBB}_1)); \text{simplify}(\text{subs}(t=0, \text{IntProdMatBB}_2)); \\ & \quad \quad \quad 0 \\ & \quad \quad \quad 0 \end{aligned} \quad (11)$$

$$\begin{aligned} & > \text{SolHom} := \text{evalm}(\text{MatExp} \& * \text{Xiniciales}) : \text{SolHom}_1; \text{SolHom}_2; \\ & \quad \quad \quad 12 e^t - 4 e^{5t} \\ & \quad \quad \quad -4 e^{5t} - 4 e^t \end{aligned} \quad (12)$$

$$\begin{aligned} & > \text{Solucion} := \text{evalm}(\text{SolHom} + \text{IntProdMatBB}) : \text{Sol}_1 := x_1(t) = \text{Solucion}_1; \text{Sol}_2 := x_2(t) \\ & \quad = \text{Solucion}_2; \\ & \text{Sol}_1 := x_1(t) = 12 e^t - 4 e^{5t} + \frac{3}{4000} (-1250 e^{4t} + 141 e^{8t} - 875 + 800 t^2 e^{3t} + 1920 t e^{3t} \\ & \quad + 1984 e^{3t}) e^{-3t} \\ & \text{Sol}_2 := x_2(t) = -4 e^{5t} - 4 e^t - \frac{1}{4000} (-423 e^{8t} - 1250 e^{4t} - 375 + 1600 t^2 e^{3t} + 2240 t e^{3t} \\ & \quad + 2048 e^{3t}) e^{-3t} \end{aligned} \quad (13)$$

$$\begin{aligned} & > \text{Comprobacion}_1 := \text{simplify}(\text{subs}(t=0, \text{Sol}_1)); \\ & \quad \quad \quad \text{Comprobacion}_1 := x_1(0) = 8 \end{aligned} \quad (14)$$

$$\begin{aligned} & > \text{Comprobacion}_2 := \text{simplify}(\text{subs}(t=0, \text{Sol}_2)); \\ & \quad \quad \quad \text{Comprobacion}_2 := x_2(0) = -8 \end{aligned} \quad (15)$$

$$\begin{aligned} & > \text{Condiciones} := x_1(0) = 8, x_2(0) = -8; \\ & \quad \quad \quad \text{Condiciones} := x_1(0) = 8, x_2(0) = -8 \end{aligned} \quad (16)$$

$$\begin{aligned} & > \text{SOL} := \text{dsolve}(\{\text{Sistema}, \text{Condiciones}\}) \\ & \text{SOL} := \left\{ x_1(t) = -\frac{15577}{4000} e^{5t} + \frac{177}{16} e^t - \frac{21}{32} e^{-3t} + \frac{3}{5} t^2 + \frac{36}{25} t + \frac{186}{125}, x_2(t) = \right. \\ & \quad \left. -\frac{15577}{4000} e^{5t} - \frac{59}{16} e^t + \frac{3}{32} e^{-3t} - \frac{2}{5} t^2 - \frac{14}{25} t - \frac{64}{125} \right\} \end{aligned} \quad (17)$$

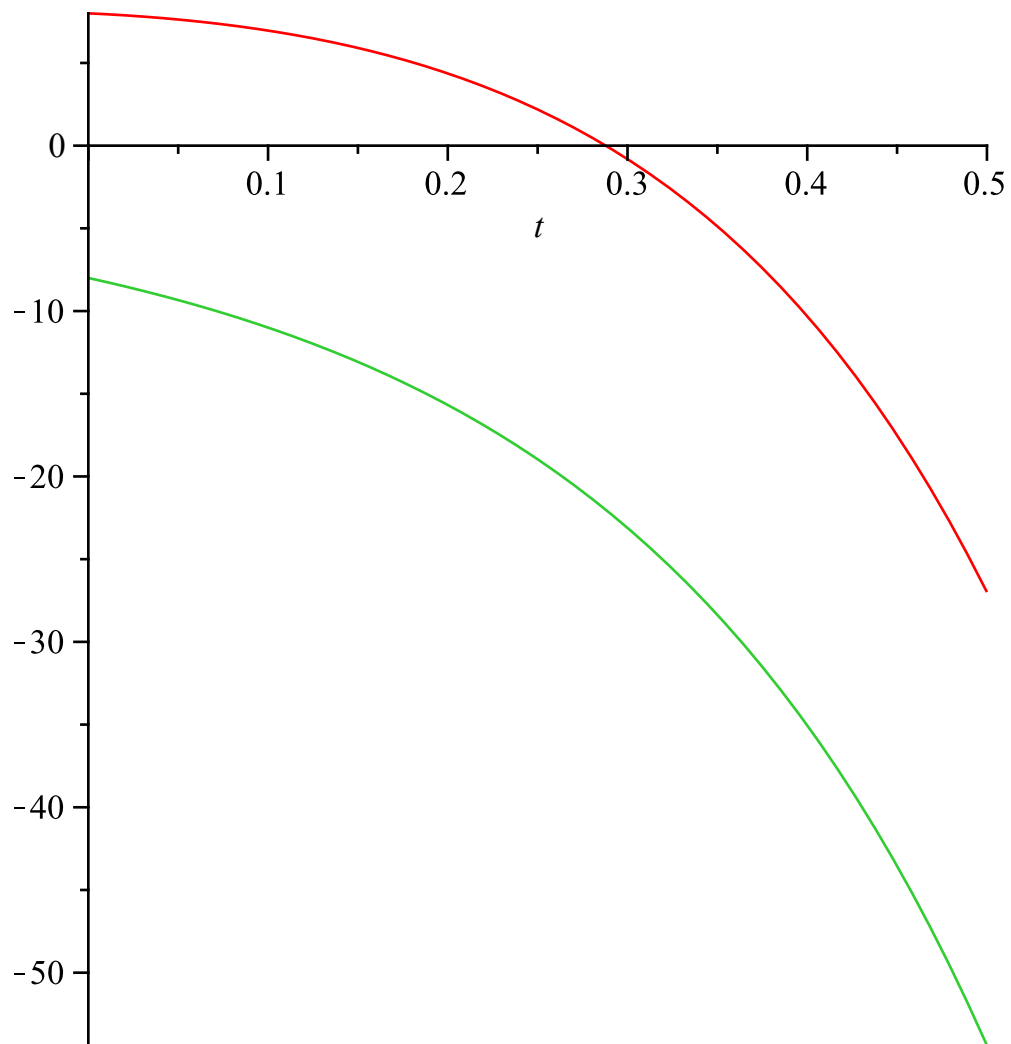
$$\begin{aligned} & > \text{SOL}_1; \\ & \quad \quad \quad x_1(t) = -\frac{15577}{4000} e^{5t} + \frac{177}{16} e^t - \frac{21}{32} e^{-3t} + \frac{3}{5} t^2 + \frac{36}{25} t + \frac{186}{125} \end{aligned} \quad (18)$$

$$\begin{aligned} & > \text{SOL}_2; \\ & \quad \quad \quad x_2(t) = -\frac{15577}{4000} e^{5t} - \frac{59}{16} e^t + \frac{3}{32} e^{-3t} - \frac{2}{5} t^2 - \frac{14}{25} t - \frac{64}{125} \end{aligned} \quad (19)$$

$$\begin{aligned} & > \text{comprobacion}_{10} := \text{simplify}(\text{rhs}(\text{Sol}_1) - \text{rhs}(\text{SOL}_1)) = 0; \\ & \quad \quad \quad \text{comprobacion}_{10} := 0 = 0 \end{aligned} \quad (20)$$

$$\begin{aligned} & > \text{comprobacion}_{20} := \text{simplify}(\text{rhs}(\text{Sol}_2) - \text{rhs}(\text{SOL}_2)) = 0; \\ & \quad \quad \quad \text{comprobacion}_{20} := 0 = 0 \end{aligned} \quad (21)$$

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> plot( [ rhs(Sol1), rhs(Sol2) ], t = 0 .. 0.5)
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