

> restart

> Sistema := diff(x<sub>1</sub>(t), t) = x<sub>1</sub>(t) + x<sub>2</sub>(t) + 2·exp(3 t) + cos(2 t), diff(x<sub>2</sub>(t), t) = -x<sub>1</sub>(t) + x<sub>2</sub>(t) + t·2 + 4·t : Sistema<sub>1</sub>; Sistema<sub>2</sub>

$$\frac{d}{dt} x_1(t) = x_1(t) + x_2(t) + 2 e^{3t} + \cos(2t)$$

$$\frac{d}{dt} x_2(t) = -x_1(t) + x_2(t) + t^2 + 4t$$

(1)

> Condiciones := x<sub>1</sub>(0) = 5, x<sub>2</sub>(0) = -5

$$\text{Condiciones} := x_1(0) = 5, x_2(0) = -5$$

(2)

> Solucion := dsolve({Sistema, Condiciones}) : Solucion<sub>1</sub>; Solucion<sub>2</sub>

$$x_1(t) = 2 e^t \cos(t) - \frac{26}{5} e^t \sin(t) + \frac{5}{2} + 3t + \frac{2}{5} \sin(2t) + \frac{4}{5} e^{3t} - \frac{3}{10} \cos(2t) + \frac{1}{2} t^2$$

$$x_2(t) = -2 e^t \sin(t) - \frac{26}{5} e^t \cos(t) + \frac{1}{2} - 2t - \frac{1}{2} t^2 + \frac{1}{10} \cos(2t) - \frac{2}{5} e^{3t} + \frac{1}{5} \sin(2t)$$

(3)

> AA := array([ [1, 1], [-1, 1] ])

$$AA := \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$$

(4)

> with(linalg) :

> MatExp := exponential(AA, t)

$$MatExp := \begin{bmatrix} e^t \cos(t) & e^t \sin(t) \\ -e^t \sin(t) & e^t \cos(t) \end{bmatrix}$$

(5)

> Xcero := array([5, -5])

$$Xcero := \begin{bmatrix} 5 & -5 \end{bmatrix}$$

(6)

> SolucionHomAsociada := evalm(MatExp &\* Xcero) : SolucionHomAsociada<sub>1</sub>;  
SolucionHomAsociada<sub>2</sub>;

$$5 e^t \cos(t) - 5 e^t \sin(t)$$

$$-5 e^t \sin(t) - 5 e^t \cos(t)$$

(7)

> Cond := map(rcurry(eval, t=0'), SolucionHomAsociada)

$$Cond := \begin{bmatrix} 5 & -5 \end{bmatrix}$$

(8)

> BB := array([2 e<sup>3t</sup> + cos(2 t), t<sup>2</sup> + 4 t]) : BB<sub>1</sub>; BB<sub>2</sub>

$$2 e^{3t} + \cos(2t)$$

$$t^2 + 4t$$

(9)

> MatExpTau := map(rcurry(eval, t=t-tau'), MatExp)

$$MatExpTau := \begin{bmatrix} e^{t-\tau} \cos(t-\tau) & e^{t-\tau} \sin(t-\tau) \\ -e^{t-\tau} \sin(t-\tau) & e^{t-\tau} \cos(t-\tau) \end{bmatrix}$$

(10)

> BBtau := map(rcurry(eval, t=tau'), BB)

(11)

$$BBtau := \begin{bmatrix} 2 e^{3\tau} + \cos(2\tau) & \tau^2 + 4\tau \end{bmatrix} \quad (11)$$

> *ProdTau* := *expand(evalm( MatExpTau &\* BBtau ) ) : ProdTau<sub>1</sub>; ProdTau<sub>2</sub>;*

$$\begin{aligned} & e^{t-\tau} \cos(t-\tau) (2 e^{3\tau} + \cos(2\tau)) + e^{t-\tau} \sin(t-\tau) (\tau^2 + 4\tau) \\ & - e^{t-\tau} \sin(t-\tau) (2 e^{3\tau} + \cos(2\tau)) + e^{t-\tau} \cos(t-\tau) (\tau^2 + 4\tau) \end{aligned} \quad (12)$$

> *IntTau* := *simplify(map(int, ProdTau, tau=0..t) ) : IntTau<sub>1</sub>; IntTau<sub>2</sub>*

$$\begin{aligned} & -3 e^t \cos(t) - \frac{1}{5} e^t \sin(t) + \frac{11}{4} + \frac{3}{5} \cos(t)^3 \sin(t) + \frac{1}{2} t^2 + 3t + \frac{7}{20} \cos(t) \sin(t) \\ & + \frac{4}{5} e^{3t} - \frac{3}{20} \sin(t) \cos(3t) - \frac{1}{20} \sin(t) \sin(3t) - \frac{7}{20} \cos(t)^2 - \frac{1}{5} \cos(t)^4 \\ & 3 e^t \sin(t) - \frac{1}{5} e^t \cos(t) + \frac{2}{5} - \frac{1}{2} t^2 - 2t + \frac{7}{20} \cos(t) \sin(t) - \frac{2}{5} e^{3t} - \frac{1}{4} \cos(t)^2 \\ & + \frac{3}{5} \cos(t)^4 + \frac{1}{5} \cos(t)^3 \sin(t) - \frac{3}{20} \cos(t) \cos(3t) - \frac{1}{20} \cos(t) \sin(3t) \end{aligned} \quad (13)$$

> *Cero* := *map(rcurry(eval, t=0'), IntTau)*

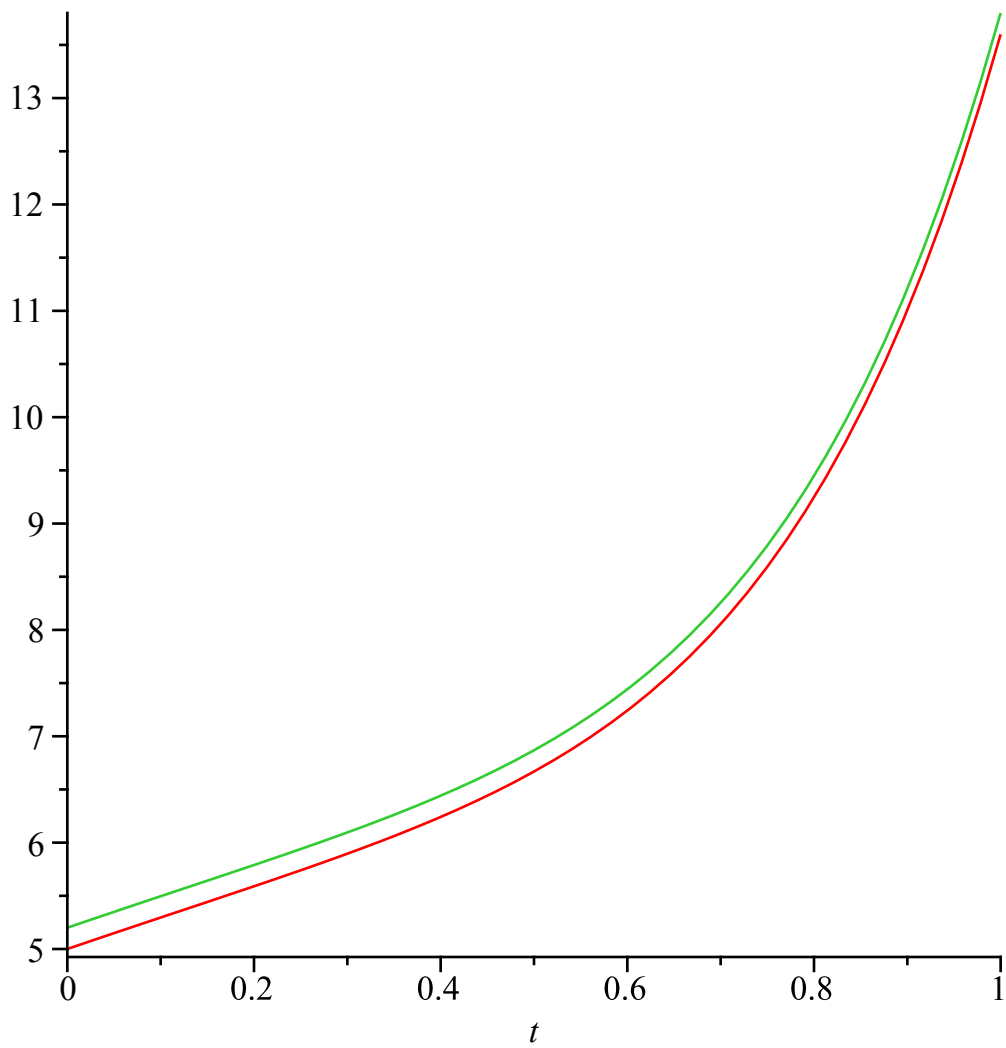
$$Cero := \begin{bmatrix} 0 & 0 \end{bmatrix} \quad (14)$$

> *SOLUCION* := *evalm(SolucionHomAsociada + IntTau) : SolPartDos<sub>1</sub> := xx<sub>1</sub>(t)*  
*= SOLUCION<sub>1</sub>; SolPartDos<sub>2</sub> := xx<sub>2</sub>(t) = SOLUCION<sub>2</sub>;*

$$\begin{aligned} SolPartDos_1 := xx_1(t) = & 2 e^t \cos(t) - \frac{26}{5} e^t \sin(t) + \frac{11}{4} + \frac{3}{5} \cos(t)^3 \sin(t) + \frac{1}{2} t^2 + 3t \\ & + \frac{7}{20} \cos(t) \sin(t) + \frac{4}{5} e^{3t} - \frac{3}{20} \sin(t) \cos(3t) - \frac{1}{20} \sin(t) \sin(3t) - \frac{7}{20} \cos(t)^2 \\ & - \frac{1}{5} \cos(t)^4 \end{aligned}$$

$$\begin{aligned} SolPartDos_2 := xx_2(t) = & -2 e^t \sin(t) - \frac{26}{5} e^t \cos(t) + \frac{2}{5} - \frac{1}{2} t^2 - 2t + \frac{7}{20} \cos(t) \sin(t) \\ & - \frac{2}{5} e^{3t} - \frac{1}{4} \cos(t)^2 + \frac{3}{5} \cos(t)^4 + \frac{1}{5} \cos(t)^3 \sin(t) - \frac{3}{20} \cos(t) \cos(3t) \\ & - \frac{1}{20} \cos(t) \sin(3t) \end{aligned} \quad (15)$$

> *plot([rhs(Solucion<sub>1</sub>), rhs(SolPartDos<sub>1</sub>) + 0.2], t=0..1)*



=  
 $\textcolor{red}{>}$  `plot([rhs(Solucion2), rhs(SolPartDos2) + 0.2], t=0..1)`

