

$$\begin{aligned}
& \text{[> restart} \\
& \text{[> AA := array([[3, 4], [2, 5]])} \\
& \qquad \qquad \qquad AA := \begin{bmatrix} 3 & 4 \\ 2 & 5 \end{bmatrix} \tag{1} \\
& \text{[> BB := array([5·exp(t), 3·exp(2·t)])} \\
& \qquad \qquad \qquad BB := \begin{bmatrix} 5 e^t & 3 e^{2t} \end{bmatrix} \tag{2} \\
& \text{[> Xinicial := array([4, -6])} \\
& \qquad \qquad \qquad Xinicial := \begin{bmatrix} 4 & -6 \end{bmatrix} \tag{3} \\
& \text{[> with(linalg) :} \\
& \text{[> MatExp := exponential(AA, t)} \\
& \qquad \qquad \qquad MatExp := \begin{bmatrix} \frac{2}{3} e^t + \frac{1}{3} e^{7t} & \frac{2}{3} e^{7t} - \frac{2}{3} e^t \\ \frac{1}{3} e^{7t} - \frac{1}{3} e^t & \frac{1}{3} e^t + \frac{2}{3} e^{7t} \end{bmatrix} \tag{4} \\
& \text{[> Ident := map(rcurry(eval, t=0'), MatExp)} \\
& \qquad \qquad \qquad Ident := \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \tag{5} \\
& \text{[> DerMatExp := map(diff, MatExp, t)} \\
& \qquad \qquad \qquad DerMatExp := \begin{bmatrix} \frac{2}{3} e^t + \frac{7}{3} e^{7t} & \frac{14}{3} e^{7t} - \frac{2}{3} e^t \\ \frac{7}{3} e^{7t} - \frac{1}{3} e^t & \frac{1}{3} e^t + \frac{14}{3} e^{7t} \end{bmatrix} \tag{6} \\
& \text{[> ProAAMatExp := evalm(AA &* MatExp)} \\
& \qquad \qquad \qquad ProAAMatExp := \begin{bmatrix} \frac{2}{3} e^t + \frac{7}{3} e^{7t} & \frac{14}{3} e^{7t} - \frac{2}{3} e^t \\ \frac{7}{3} e^{7t} - \frac{1}{3} e^t & \frac{1}{3} e^t + \frac{14}{3} e^{7t} \end{bmatrix} \tag{7} \\
& \text{[> Comprocion := evalm(DerMatExp - ProAAMatExp)} \\
& \qquad \qquad \qquad Comprocion := \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \tag{8} \\
& \text{[> MatExpTau := map(rcurry(eval, t=t-tau'), MatExp)} \\
& \qquad \qquad \qquad MatExpTau := \begin{bmatrix} \frac{2}{3} e^{t-\tau} + \frac{1}{3} e^{7t-7\tau} & \frac{2}{3} e^{7t-7\tau} - \frac{2}{3} e^{t-\tau} \\ \frac{1}{3} e^{7t-7\tau} - \frac{1}{3} e^{t-\tau} & \frac{1}{3} e^{t-\tau} + \frac{2}{3} e^{7t-7\tau} \end{bmatrix} \tag{9} \\
& \text{[> BBtau := map(rcurry(eval, t=tau'), BB)} \\
& \tag{10}
\end{aligned}$$

$$BBtau := \begin{bmatrix} 5 e^{\tau} & 3 e^{2\tau} \end{bmatrix} \quad (10)$$

> $ProTau := evalm(MatExpTau \&* BBtau) : ProTau_1; ProTau_2$

$$\begin{aligned} & 5 \left(\frac{2}{3} e^{t-\tau} + \frac{1}{3} e^{7t-7\tau} \right) e^{\tau} + 3 \left(\frac{2}{3} e^{7t-7\tau} - \frac{2}{3} e^{t-\tau} \right) e^{2\tau} \\ & 5 \left(\frac{1}{3} e^{7t-7\tau} - \frac{1}{3} e^{t-\tau} \right) e^{\tau} + 3 \left(\frac{1}{3} e^{t-\tau} + \frac{2}{3} e^{7t-7\tau} \right) e^{2\tau} \end{aligned} \quad (11)$$

> $ParteNoHom := map(int, ProTau, tau = 2..t)$

$$\begin{aligned} ParteNoHom := & \left[-\frac{125}{18} e^t + \frac{5}{18} e^{7t-12} + \frac{2}{5} e^{-10+7t} + 2 e^{2+t} + \frac{10}{3} t e^t - \frac{12}{5} e^{2t}, \right. \\ & \left. \frac{5}{18} e^{7t-12} + \frac{55}{18} e^t - e^{2+t} + \frac{2}{5} e^{-10+7t} - \frac{5}{3} t e^t + \frac{3}{5} e^{2t} \right] \end{aligned} \quad (12)$$

> $Comprobacion_2 := map(rcurry(eval, t=2'), ParteNoHom)$

$$Comprobacion_2 := \begin{bmatrix} 0 & 0 \end{bmatrix} \quad (13)$$

> $MatExpDos := map(rcurry(eval, t=t-2'), MatExp)$

$$MatExpDos := \begin{bmatrix} \frac{2}{3} e^{t-2} + \frac{1}{3} e^{7t-14} & \frac{2}{3} e^{7t-14} - \frac{2}{3} e^{t-2} \\ \frac{1}{3} e^{7t-14} - \frac{1}{3} e^{t-2} & \frac{1}{3} e^{t-2} + \frac{2}{3} e^{7t-14} \end{bmatrix} \quad (14)$$

> $ParteHom := evalm(MatExpDos \&* Xinicial)$

$$ParteHom := \begin{bmatrix} \frac{20}{3} e^{t-2} - \frac{8}{3} e^{7t-14} & -\frac{8}{3} e^{7t-14} - \frac{10}{3} e^{t-2} \end{bmatrix} \quad (15)$$

> $Solucion := evalm(ParteHom + ParteNoHom)$

$$\begin{aligned} Solucion := & \left[\frac{20}{3} e^{t-2} - \frac{8}{3} e^{7t-14} - \frac{125}{18} e^t + \frac{5}{18} e^{7t-12} + \frac{2}{5} e^{-10+7t} + 2 e^{2+t} + \frac{10}{3} t e^t \right. \\ & - \frac{12}{5} e^{2t}, -\frac{8}{3} e^{7t-14} - \frac{10}{3} e^{t-2} + \frac{5}{18} e^{7t-12} + \frac{55}{18} e^t - e^{2+t} + \frac{2}{5} e^{-10+7t} \\ & \left. - \frac{5}{3} t e^t + \frac{3}{5} e^{2t} \right] \end{aligned} \quad (16)$$

> $SolUno := x_1(t) = Solucion_1; SolDos := x_2(t) = Solucion_2$

$$\begin{aligned} SolUno := x_1(t) = & \frac{20}{3} e^{t-2} - \frac{8}{3} e^{7t-14} - \frac{125}{18} e^t + \frac{5}{18} e^{7t-12} + \frac{2}{5} e^{-10+7t} + 2 e^{2+t} \\ & + \frac{10}{3} t e^t - \frac{12}{5} e^{2t} \\ SolDos := x_2(t) = & -\frac{8}{3} e^{7t-14} - \frac{10}{3} e^{t-2} + \frac{5}{18} e^{7t-12} + \frac{55}{18} e^t - e^{2+t} + \frac{2}{5} e^{-10+7t} \\ & - \frac{5}{3} t e^t + \frac{3}{5} e^{2t} \end{aligned} \quad (17)$$

> $CondInicial_1 := eval(subs(t=2, rhs(SolUno)))$

$$CondInicial_1 := 4 \quad (18)$$

> $ConInicial_2 := eval(subs(t=2, rhs(SolDos)))$

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$ConInicial_2 := -6$

(19)