

$$\begin{aligned} &> \text{restart} \\ &> \text{expand}((m-1) \cdot (m-2) \cdot (m-3) \cdot (m-4)) = 0 \\ &\quad m^4 - 10 m^3 + 35 m^2 - 50 m + 24 = 0 \end{aligned} \quad (1)$$

$$\begin{aligned} &> \text{Condiciones} := y(0) = 1, D(y)(0) = -2, D(D(y))(0) = 3, D(D(D(y)))(0) = -4; \\ &\quad \text{Condiciones} := y(0) = 1, D(y)(0) = -2, D^{(2)}(y)(0) = 3, D^{(3)}(y)(0) = -4 \end{aligned} \quad (2)$$

$$\begin{aligned} &> \text{Ecuacion} := \text{diff}(y(t), t\$4) - 10 \text{diff}(y(t), t\$3) + 35 \text{diff}(y(t), t\$2) - 50 \text{diff}(y(t), t) + 24 \\ &\quad \cdot y(t) = 0 \\ &\quad \text{Ecuacion} := \frac{d^4}{dt^4} y(t) - 10 \left( \frac{d^3}{dt^3} y(t) \right) + 35 \left( \frac{d^2}{dt^2} y(t) \right) - 50 \left( \frac{d}{dt} y(t) \right) + 24 y(t) = 0 \end{aligned} \quad (3)$$

$$\begin{aligned} &> AA := \text{array}([ [0, 1, 0, 0], [0, 0, 1, 0], [0, 0, 0, 1], [-24, 50, -35, 10] ]) \\ &\quad AA := \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -24 & 50 & -35 & 10 \end{bmatrix} \end{aligned} \quad (4)$$

$$\begin{aligned} &> Ycero := \text{array}([1, -2, 3, -4]) \\ &\quad Ycero := \begin{bmatrix} 1 & -2 & 3 & -4 \end{bmatrix} \end{aligned} \quad (5)$$

> with(linalg) :

> ME := exponential(AA, t) :

$$\begin{aligned} &> ME[1, 1] \\ &\quad 4 e^t - 6 e^{2t} + 4 e^{3t} - e^{4t} \end{aligned} \quad (6)$$

$$\begin{aligned} &> ME[4, 4] \\ &\quad -\frac{1}{6} e^t + \frac{32}{3} e^{4t} - \frac{27}{2} e^{3t} + 4 e^{2t} \end{aligned} \quad (7)$$

$$\begin{aligned} &> SOL := \text{simplify}(\text{evalm}(ME \&* Ycero)) : y_1(t) = SOL_1; y_2(t) = SOL_2; y_3(t) = SOL_3; y_4(t) \\ &\quad = SOL_4 \end{aligned}$$

$$\begin{aligned} y_1(t) &= \frac{107}{6} e^t - 39 e^{2t} + \frac{61}{2} e^{3t} - \frac{25}{3} e^{4t} \\ y_2(t) &= -\frac{100}{3} e^{4t} + \frac{183}{2} e^{3t} - 78 e^{2t} + \frac{107}{6} e^t \\ y_3(t) &= -\frac{400}{3} e^{4t} + \frac{549}{2} e^{3t} - 156 e^{2t} + \frac{107}{6} e^t \\ y_4(t) &= -312 e^{2t} + \frac{107}{6} e^t + \frac{1647}{2} e^{3t} - \frac{1600}{3} e^{4t} \end{aligned} \quad (8)$$

$$\begin{aligned} &> \text{SolPart} := \text{dsolve}(\{\text{Ecuacion}, \text{Condiciones}\}) \\ &\quad \text{SolPart} := y(t) = \frac{107}{6} e^t - 39 e^{2t} + \frac{61}{2} e^{3t} - \frac{25}{3} e^{4t} \end{aligned} \quad (9)$$

$$\begin{aligned} &> \text{DerSolPart} := \text{diff}(\text{SolPart}, t) \\ &\quad \text{DerSolPart} := \frac{d}{dt} y(t) = -\frac{100}{3} e^{4t} + \frac{183}{2} e^{3t} - 78 e^{2t} + \frac{107}{6} e^t \end{aligned} \quad (10)$$

$$\begin{aligned} &> \text{DerDerSolPart} := \text{diff}(\text{SolPart}, t\$2) \\ &\quad \text{DerDerSolPart} := \frac{d^2}{dt^2} y(t) = -\frac{400}{3} e^{4t} + \frac{549}{2} e^{3t} - 156 e^{2t} + \frac{107}{6} e^t \end{aligned} \quad (11)$$

$$DerDerSolPart := \frac{d^2}{dt^2} y(t) = -\frac{400}{3} e^{4t} + \frac{549}{2} e^{3t} - 156 e^{2t} + \frac{107}{6} e^t \quad (11)$$

> *DerDerDerSolPart := diff(SolPart, t\$3)*

$$DerDerDerSolPart := \frac{d^3}{dt^3} y(t) = -312 e^{2t} + \frac{107}{6} e^t + \frac{1647}{2} e^{3t} - \frac{1600}{3} e^{4t} \quad (12)$$

> *restart*

> *AA := array([ [2, 3], [1, 4] ])*

$$AA := \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} \quad (13)$$

> *with(linalg) :*

> *ME := exponential(AA, t)*

$$ME := \begin{bmatrix} \frac{3}{4} e^t + \frac{1}{4} e^{5t} & \frac{3}{4} e^{5t} - \frac{3}{4} e^t \\ \frac{1}{4} e^{5t} - \frac{1}{4} e^t & \frac{1}{4} e^t + \frac{3}{4} e^{5t} \end{bmatrix} \quad (14)$$

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