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> restart
> Sist := diff(x(t), t) = 2·x(t) + 3·y(t), diff(y(t), t) = x(t) + 4·y(t) : Sist[1]; Sist[2]

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$$\begin{aligned} \frac{d}{dt} x(t) &= 2x(t) + 3y(t) \\ \frac{d}{dt} y(t) &= x(t) + 4y(t) \end{aligned} \quad (1)$$

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> SolGral := dsolve({Sist}, {x(t), y(t)}) : SolGral[1]; SolGral[2]

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$$\begin{aligned} x(t) &= \_C1 e^{5t} + \_C2 e^t \\ y(t) &= \_C1 e^{5t} - \frac{1}{3} \_C2 e^t \end{aligned} \quad (2)$$

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> Cond := x(0) = 3, y(0) = -4

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$$Cond := x(0) = 3, y(0) = -4 \quad (3)$$

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> SolPart := dsolve({Sist, Cond}, {x(t), y(t)}) : SolPart[1]; SolPart[2]

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$$\begin{aligned} x(t) &= -\frac{9}{4} e^{5t} + \frac{21}{4} e^t \\ y(t) &= -\frac{9}{4} e^{5t} - \frac{7}{4} e^t \end{aligned} \quad (4)$$

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> with(LinearAlgebra) :
> with(linalg) :
> AA := Matrix([ [2, 3], [1, 4] ])

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$$AA := \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} \quad (5)$$

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> MatExpUno := exponential(AA, t)

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$$MatExpUno := \begin{bmatrix} \frac{3}{4} e^t + \frac{1}{4} e^{5t} & \frac{3}{4} e^{5t} - \frac{3}{4} e^t \\ \frac{1}{4} e^{5t} - \frac{1}{4} e^t & \frac{1}{4} e^t + \frac{3}{4} e^{5t} \end{bmatrix} \quad (6)$$

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> MatExpDos := MatrixExponential(AA, t)

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$$MatExpDos := \begin{bmatrix} \frac{3}{4} e^t + \frac{1}{4} e^{5t} & \frac{3}{4} e^{5t} - \frac{3}{4} e^t \\ \frac{1}{4} e^{5t} - \frac{1}{4} e^t & \frac{1}{4} e^t + \frac{3}{4} e^{5t} \end{bmatrix} \quad (7)$$

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> Identidad := map(rcurry(eval, t='0'), MatExpDos)

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$$Identidad := \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad (8)$$

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> DerMatExp := map(diff, MatExpDos, t)

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$$DerMatExp := \begin{bmatrix} \frac{3}{4} e^t + \frac{5}{4} e^{5t} & \frac{15}{4} e^{5t} - \frac{3}{4} e^t \\ \frac{5}{4} e^{5t} - \frac{1}{4} e^t & \frac{1}{4} e^t + \frac{15}{4} e^{5t} \end{bmatrix} \quad (9)$$

> *Comprobacion* := evalm(DerMatExp = evalm(AA &\* MatExpDos))

$$\text{Comprobacion} := \begin{bmatrix} \frac{3}{4} e^t + \frac{5}{4} e^{5t} & \frac{15}{4} e^{5t} - \frac{3}{4} e^t \\ \frac{5}{4} e^{5t} - \frac{1}{4} e^t & \frac{1}{4} e^t + \frac{15}{4} e^{5t} \end{bmatrix} = \begin{bmatrix} \frac{3}{4} e^t + \frac{5}{4} e^{5t} & \frac{15}{4} e^{5t} - \frac{3}{4} e^t \\ \frac{5}{4} e^{5t} - \frac{1}{4} e^t & \frac{1}{4} e^t + \frac{15}{4} e^{5t} \end{bmatrix} \quad (10)$$

> *InvMatExp* := map(rcurry(eval, t=-t'), MatExpDos)

$$\text{InvMatExp} := \begin{bmatrix} \frac{3}{4} e^{-t} + \frac{1}{4} e^{-5t} & \frac{3}{4} e^{-5t} - \frac{3}{4} e^{-t} \\ \frac{1}{4} e^{-5t} - \frac{1}{4} e^{-t} & \frac{1}{4} e^{-t} + \frac{3}{4} e^{-5t} \end{bmatrix} \quad (11)$$

> *MatExpDos*

$$\begin{bmatrix} \frac{3}{4} e^t + \frac{1}{4} e^{5t} & \frac{3}{4} e^{5t} - \frac{3}{4} e^t \\ \frac{1}{4} e^{5t} - \frac{1}{4} e^t & \frac{1}{4} e^t + \frac{3}{4} e^{5t} \end{bmatrix} \quad (12)$$

> *IdentidadDos* := simplify(evalm(InvMatExp &\* MatExpDos))

$$\text{IdentidadDos} := \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad (13)$$

> *Xcero* := array([3,-4])

$$\text{Xcero} := \begin{bmatrix} 3 & -4 \end{bmatrix} \quad (14)$$

> *SolPartDos* := evalm(MatExpDos &\* Xcero) : x(t) = SolPartDos[1]; y(t) = SolPartDos[2]

$$\begin{aligned} x(t) &= -\frac{9}{4} e^{5t} + \frac{21}{4} e^t \\ y(t) &= -\frac{9}{4} e^{5t} - \frac{7}{4} e^t \end{aligned} \quad (15)$$

> *SolPart*[1]; *SolPart*[2]

$$\begin{aligned} x(t) &= -\frac{9}{4} e^{5t} + \frac{21}{4} e^t \\ y(t) &= -\frac{9}{4} e^{5t} - \frac{7}{4} e^t \end{aligned} \quad (16)$$

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