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> restart
> SistEcDif := diff(x[1](t), t) = x[1](t) + 2·x[2](t) + 5·exp(4·t) + t2, diff(x[2](t), t) = 2
·x[1](t) + 3·x[2](t) + 6·t + cos(2·t) : SistEcDif[1]; SistEcDif[2]

$$\frac{d}{dt} x_1(t) = x_1(t) + 2 x_2(t) + 5 e^{4t} + t^2$$


$$\frac{d}{dt} x_2(t) = 2 x_1(t) + 3 x_2(t) + 6 t + \cos(2 t)$$
 (1)
> Xcero := array([5, -4])

$$Xcero := \begin{bmatrix} 5 & -4 \end{bmatrix}$$
 (2)
> AA := array([[1, 2], [2, 3]])

$$AA := \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$$
 (3)
> BB := array([5 e4t + t2, 6 t + cos(2 t)])

$$BB := \begin{bmatrix} 5 e^{4t} + t^2 & 6 t + \cos(2 t) \end{bmatrix}$$
 (4)
> with(linalg) :
> MatExp := exponential(AA, t) : MatExp[1, 1] : evalf(%, 3); MatExp[1, 2] : evalf(%, 3);
MatExp[2, 1] : evalf(%, 3); MatExp[2, 2] : evalf(%, 3)

$$\begin{aligned} &0.724 e^{-0.24t} + 0.276 e^{4.24t} \\ &-0.448 e^{-0.24t} + 0.448 e^{4.24t} \\ &-0.448 e^{-0.24t} + 0.448 e^{4.24t} \\ &0.276 e^{-0.24t} + 0.724 e^{4.24t} \end{aligned}$$
 (5)
> DerMatExp := map(diff, MatExp, t) :
> Comprobar := simplify(evalm(DerMatExp - AA&*MatExp))

$$Comprobar := \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$
 (6)
> ComprobDos := map(rcurry(eval, t=0'), MatExp)

$$ComprobDos := \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$
 (7)
> InvMatExp := map(rcurry(eval, t=-t'), MatExp) :
> CompTres := simplify(evalm(MatExp &* InvMatExp))

$$CompTres := \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$
 (8)
> SolHom := evalm(MatExp &* Xcero) : SolHom[1] : evalf(%, 3); SolHom[2] : evalf(%, 3)

$$\begin{aligned} &5.41 e^{-0.24t} - 0.41 e^{4.24t} \\ &-3.34 e^{-0.24t} - 0.66 e^{4.24t} \end{aligned}$$
 (9)
> eval(Xcero)

$$\begin{bmatrix} 5 & -4 \end{bmatrix}$$
 (10)
> CompCuatro := map(rcurry(eval, t=0'), SolHom)

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$$\text{CompCuatro} := \begin{bmatrix} 5 & -4 \end{bmatrix} \quad (11)$$

>  $\text{MatExpTau} := \text{map}(\text{rcurry}(\text{eval}, t = 't - \text{tau}'), \text{MatExp}) : \text{MatExpTau}[1, 1] : \text{evalf}(\%, 3);$   
 $\text{MatExpTau}[1, 2] : \text{evalf}(\%, 3); \text{MatExpTau}[2, 1] : \text{evalf}(\%, 3); \text{MatExpTau}[2, 2] :$   
 $\text{evalf}(\%, 3)$

$$\begin{aligned} & 0.724 e^{-0.24t + 0.24\tau} + 0.276 e^{4.24t - 4.24\tau} \\ & -0.448 e^{-0.24t + 0.24\tau} + 0.448 e^{4.24t - 4.24\tau} \\ & -0.448 e^{-0.24t + 0.24\tau} + 0.448 e^{4.24t - 4.24\tau} \\ & 0.276 e^{-0.24t + 0.24\tau} + 0.724 e^{4.24t - 4.24\tau} \end{aligned} \quad (12)$$

>  $\text{BBtau} := \text{map}(\text{rcurry}(\text{eval}, t = '\text{tau}'), \text{BB})$

$$\text{BBtau} := \begin{bmatrix} 5 e^{4\tau} + \tau^2 & 6\tau + \cos(2\tau) \end{bmatrix} \quad (13)$$

>  $\text{ProdTau} := \text{evalm}(\text{MatExpTau} \& \text{BBtau}) : \text{ProdTau}[1] : \text{evalf}(\%, 3); \text{ProdTau}[2] : \text{evalf}(\%, 3);$

$$\begin{aligned} & (0.724 e^{-0.24t + 0.24\tau} + 0.276 e^{4.24t - 4.24\tau}) (5 e^{4\tau} + \tau^2) + (-0.448 e^{-0.24t + 0.24\tau} \\ & + 0.448 e^{4.24t - 4.24\tau}) (6\tau + \cos(2\tau)) \\ & (-0.448 e^{-0.24t + 0.24\tau} + 0.448 e^{4.24t - 4.24\tau}) (5 e^{4\tau} + \tau^2) + (0.276 e^{-0.24t + 0.24\tau} \\ & + 0.724 e^{4.24t - 4.24\tau}) (6\tau + \cos(2\tau)) \end{aligned} \quad (14)$$

>  $\text{IntProdTau} := \text{map}(\text{int}, \text{ProdTau}, \text{tau} = 0..t) : \text{IntProdTau}[1] : \text{evalf}(\%, 3); \text{IntProdTau}[2] :$   
 $\text{evalf}(\%, 3);$

$$\begin{aligned} & 0.00112 (5700. e^{6.48t} - 4450. e^{6.24t} - 1.42 \cdot 10^5 e^{2.2t} - 320. \sin(t) \cos(t) e^{2.24t} \\ & - 200. \cos(t)^2 e^{2.24t} + 2670. t^2 e^{2.24t} - 33800. t e^{2.24t} + 1.41 \cdot 10^5 e^{2.24t}) e^{-2.24t} \\ & -0.00112 (-8700. e^{6.48t} + 8900. e^{6.24t} - 87500. e^{2.2t} - 360. \sin(t) \cos(t) e^{2.24t} \\ & + 220. \cos(t)^2 e^{2.24t} + 1780. t^2 e^{2.24t} - 19600. t e^{2.24t} + 87100. e^{2.24t}) e^{-2.24t} \end{aligned} \quad (15)$$

>  $\text{CompCinco} := \text{map}(\text{rcurry}(\text{eval}, t = '0'), \text{IntProdTau})$

$$\text{CompCinco} := \begin{bmatrix} 0 & 0 \end{bmatrix} \quad (16)$$

>  $\text{SolParticular} := \text{evalm}(\text{SolHom} + \text{IntProdTau}) : x[1](t) = \text{evalf}(\text{SolParticular}[1], 2); x[2](t)$   
 $= \text{evalf}(\text{SolParticular}[2], 2)$

$$\begin{aligned} x_1(t) &= 5.4 e^{-0.2t} - 0.4 e^{4.2t} + 0.0011 (5000. e^{6.4t} - 4400. e^{6.2t} - 1.4 \cdot 10^5 e^{2.2t} \\ & - 320. \sin(t) \cos(t) e^{2.2t} - 200. \cos(t)^2 e^{2.2t} + 2700. t^2 e^{2.2t} - 34000. t e^{2.2t} \\ & + 1.4 \cdot 10^5 e^{2.2t}) e^{-2.2t} \\ x_2(t) &= -3.3 e^{-0.2t} - 0.7 e^{4.2t} - 0.0011 (-8000. e^{6.4t} + 8900. e^{6.2t} - 88000. e^{2.2t} \\ & - 360. \sin(t) \cos(t) e^{2.2t} + 220. \cos(t)^2 e^{2.2t} + 1800. t^2 e^{2.2t} - 20000. t e^{2.2t} \\ & + 87000. e^{2.2t}) e^{-2.2t} \end{aligned} \quad (17)$$

>  $\text{CompCondIni} := \text{map}(\text{rcurry}(\text{eval}, t = '0'), \text{SolParticular})$

$$\text{CompCondIni} := \begin{bmatrix} 5 & -4 \end{bmatrix} \quad (18)$$

>  $\text{CompFinalUno} := \text{simplify}(\text{eval}(\text{subs}(x[1](t) = \text{SolParticular}[1], x[2](t) = \text{SolParticular}[2],$   
 $\text{lhs}(\text{SistEcDif}[1]) - \text{rhs}(\text{SistEcDif}[1]) = 0)))$

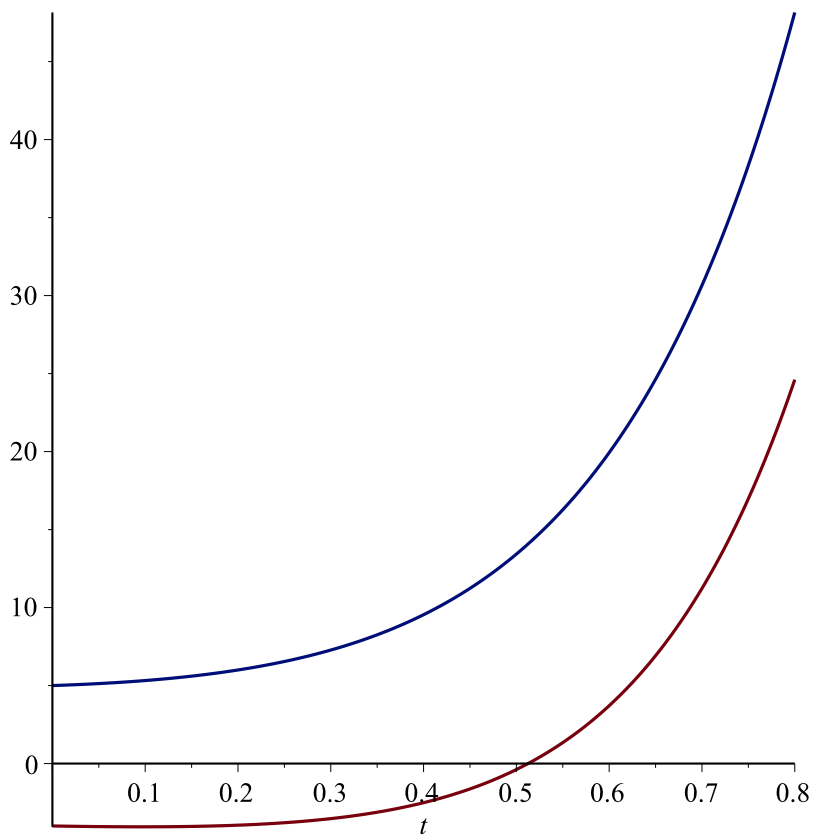
$$\text{CompFinalUno} := 0 = 0 \quad (19)$$

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> CompFinalDos := expand(simplify( eval(subs(x[1](t) = SolParticular[1], x[2](t)
= SolParticular[2], lhs(SistEcDif[2]) - rhs(SistEcDif[2]) = 0) ) ) )
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CompFinalDos := 0 = 0
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(20)

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> plot( {SolParticular[1], SolParticular[2]}, t = 0 .. 0.8)
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