```
> restart
> AA := array([[0, 0, 1, 0], [0, 0, 0, 1], [-10, 4, 0, 0], [4, -4, 0, 0]])
```

$$AA := \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -10 & 4 & 0 & 0 \\ 4 & -4 & 0 & 0 \end{bmatrix} \tag{1}$$

```
> Xcero := array([[4/60, 1/10, 0, 0]])
```

$$Xcero := \begin{bmatrix} \dfrac{1}{15} & \dfrac{1}{10} & 0 & 0 \end{bmatrix} \tag{2}$$

```
> with(linalg) :
> MatExp := exponential(AA, t) :
> MatExp[1, 1]; evalf(%, 3)
```

$$\frac{8 \cos(2\sqrt{3}\, t) + 2 \cos(\sqrt{2}\, t)}{(2\sqrt{3} + \sqrt{2})(2\sqrt{3} - \sqrt{2})}$$

$$0.800 \cos(3.46\, t) + 0.200 \cos(1.41\, t) \tag{3}$$

```
> MatExp[4, 4]; evalf(%, 3)
```

$$\frac{2 \cos(2\sqrt{3}\, t) + 8 \cos(\sqrt{2}\, t)}{(2\sqrt{3} + \sqrt{2})(2\sqrt{3} - \sqrt{2})}$$

$$0.200 \cos(3.46\, t) + 0.800 \cos(1.41\, t) \tag{4}$$

```
> SolPart := evalm(MatExp &* Xcero) :
> x[1](t) := SolPart[1]; xx[1] := evalf(%, 3)
```

$$x_1(t) := \frac{1}{15}\frac{8\cos(2\sqrt{3}\,t) + 2\cos(\sqrt{2}\,t)}{(2\sqrt{3}+\sqrt{2})(2\sqrt{3}-\sqrt{2})} + \frac{1}{10}\frac{-4\cos(2\sqrt{3}\,t) + 4\cos(\sqrt{2}\,t)}{(2\sqrt{3}+\sqrt{2})(2\sqrt{3}-\sqrt{2})}$$

$$xx_1 := 0.0134 \cos(3.46\, t) + 0.0533 \cos(1.41\, t) \tag{5}$$

```
> x[2](t) := SolPart[2]; xx[2] := evalf(%, 3)
```

$$x_2(t) := \frac{1}{15}\frac{-4\cos(2\sqrt{3}\,t) + 4\cos(\sqrt{2}\,t)}{(2\sqrt{3}+\sqrt{2})(2\sqrt{3}-\sqrt{2})} + \frac{1}{10}\frac{2\cos(2\sqrt{3}\,t) + 8\cos(\sqrt{2}\,t)}{(2\sqrt{3}+\sqrt{2})(2\sqrt{3}-\sqrt{2})}$$

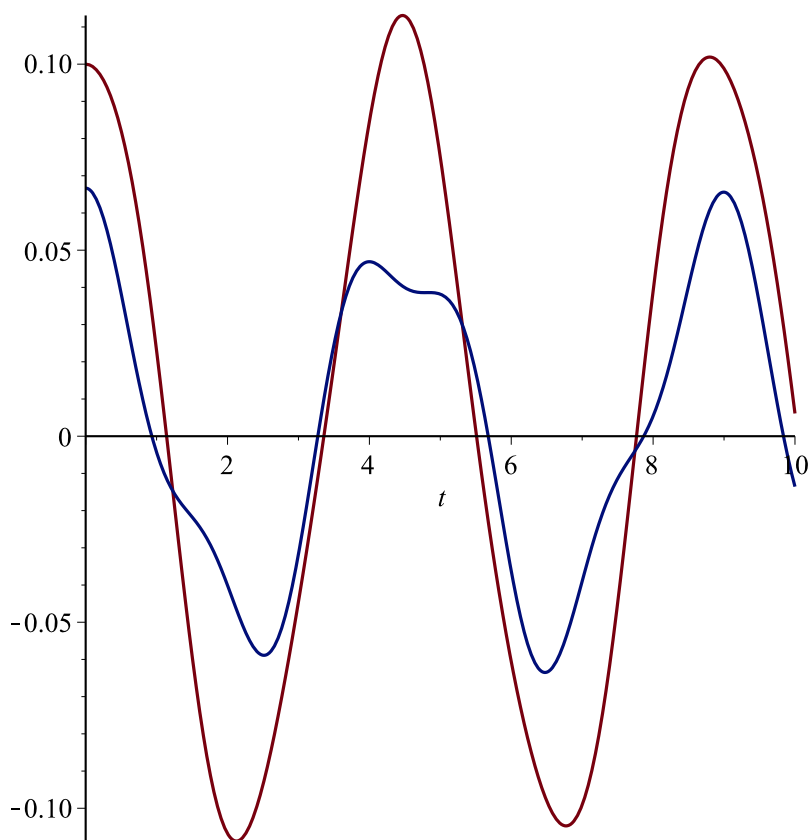$$xx_2 := -0.0067 \cos(3.46\, t) + 0.107 \cos(1.41\, t) \tag{6}$$

```
> EcuaOrig := simplify(eval(diff(x[1](t), t$2) = -6·x[1](t) + 4·(x[2](t) - x[1](t))))
```

$$EcuaOrig := -\frac{8}{75}\cos(\sqrt{2}\,t) - \frac{4}{25}\cos(2\sqrt{3}\,t) = -\frac{8}{75}\cos(\sqrt{2}\,t) - \frac{4}{25}\cos(2\sqrt{3}\,t) \tag{7}$$

```
> EcuaOrigDos := simplify(eval(diff(x[2](t), t$2) = -4·(x[2](t) - x[1](t))))
```

$$EcuaOrigDos := \frac{2}{25}\cos(2\sqrt{3}\,t) - \frac{16}{75}\cos(\sqrt{2}\,t) = \frac{2}{25}\cos(2\sqrt{3}\,t) - \frac{16}{75}\cos(\sqrt{2}\,t) \tag{8}$$

```
> plot({x[1](t), x[2](t)}, t = 0..10)
```

> *restart*

> $AA := array([[0, 0, 1, 0], [0, 0, 0, 1], [-10, 6, 0, 0], [6, -6, 0, 0]])$

$$AA := \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -10 & 6 & 0 & 0 \\ 6 & -6 & 0 & 0 \end{bmatrix}$$

(9)

> $Xcero := array\left(\left[\dfrac{6}{40}, \dfrac{1}{10}, 0, 0\right]\right)$

$$Xcero := \begin{bmatrix} \dfrac{3}{20} & \dfrac{1}{10} & 0 & 0 \end{bmatrix}$$

(10)

> $with(linalg):$

> $MatExp := exponential(AA, t):$

> $MatExp[1, 1]; evalf(\%, 3)$

$$\left(-\cos\left(\sqrt{8 - 2\sqrt{10}}\; t\right)\sqrt{8 - 2\sqrt{10}}\;\left(8 + 2\sqrt{10}\right)^{3/2} + \left(8 - 2\sqrt{10}\right)^{3}\right.$$
$$\left. ^{/2}\cos\left(\sqrt{8 - 2\sqrt{10}}\; t\right)\sqrt{8 + 2\sqrt{10}}\right.$$

$$-2\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}\;\sqrt{10}$$

$$+2\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}\;\sqrt{10}$$

$$+2\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}+56\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)$$

$$-2\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}+24\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)$$

$$-20\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{10}-12\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{10}\right)\Big/\left(\left(\sqrt{8-2\sqrt{10}}\right.\right.$$

$$\left.-\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)^2\sqrt{8-2\sqrt{10}}\right)+\left(I\left((8-2\sqrt{10})^{3/2}\sin\!\left(\sqrt{8-2}\right.\right.\right.$$

$$-8\sin\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}\right)\Big/\left(\left(\sqrt{8-2\sqrt{10}}\right.\right.$$

$$\left.-\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)^2\sqrt{8-2\sqrt{10}}\right)$$

$$0.335\cos(1.30\,t)+0.656\cos(3.78\,t) \tag{11}$$

> $MatExp[4,4]; evalf(\%,3)$

$$\left(-\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;(8+2\sqrt{10})^{3/2}+(8-2\sqrt{10})^3\right.$$

$${}^{/2}\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8+2\sqrt{10}}$$

$$-2\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}\;\sqrt{10}$$

$$+2\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}\;\sqrt{10}$$

$$-2\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}+24\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)$$

$$+2\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}+56\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)$$

$$-12\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{10}-20\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{10}\right)\Big/\left(\left(\sqrt{8-2\sqrt{10}}\right.\right.$$

$$\left.-\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)^2\sqrt{8-2\sqrt{10}}\right)+\left(I\left((8-2\sqrt{10})^{3/2}\sin\!\left(\sqrt{8-2}\right.\right.\right.$$

$$-8\sin\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}\right)\Big/\left(\left(\sqrt{8-2\sqrt{10}}\right.\right.$$

$$\left.-\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)^2\sqrt{8-2\sqrt{10}}\right)$$

$$0.654\cos(1.30\,t)+0.341\cos(3.78\,t) \tag{12}$$

> $SolPart := evalm(MatExp\,\&*\,Xcero):$

> $x[1](t) := SolPart[1]; xx[1] := evalf(\%,3)$

$$x_1(t) := \frac{3}{20}\left(-\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;(8+2\sqrt{10})^{3/2}+(8-2\sqrt{10})^3\right.$$

$${}^{/2}\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8+2\sqrt{10}}$$

$$-2\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}\;\sqrt{10}$$

$$+2\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}\;\sqrt{10}$$

$$+2\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}+56\cos\!\left(\sqrt{8-2\sqrt{10}}\;t\right)$$

$$-2\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\;\sqrt{8+2\sqrt{10}}+24\cos\!\left(\sqrt{8+2\sqrt{10}}\;t\right)$$

$$-20\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{10}-12\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{10}\right)\Bigg/\left(\left(\sqrt{8-2\sqrt{10}}\right.\right.$$

$$-\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)^{2}\sqrt{8-2\sqrt{10}}\right)+\left(\frac{3}{20}\,\mathrm{I}\left(\left(8-2\sqrt{10}\right)^{3/2}\sin\left(\sqrt{8}\right.\right.$$

$$-8\sin\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}\right)\right)\Bigg/\left(\left(\sqrt{8-2\sqrt{10}}\right.\right.$$

$$-\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)^{2}\sqrt{8-2\sqrt{10}}\right)$$

$$+\frac{1}{10}\;\frac{-6\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)+6\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)}{\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}-\sqrt{8+2\sqrt{10}}\right)}$$

$$xx_1 := 0.0978\cos(1.30\,t)+0.0508\cos(3.78\,t) \tag{13}$$

> $x[2](t) := SolPart[2]; xx[2] := evalf(\%, 3)$

$$x_2(t) := \frac{3}{20}\;\frac{-6\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)+6\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)}{\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}-\sqrt{8+2\sqrt{10}}\right)}+\frac{1}{10}\,\Big($$

$$-\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\left(8+2\sqrt{10}\right)^{3/2}+\left(8-2\sqrt{10}\right)^{3}$$

$$^{/2}\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8+2\sqrt{10}}$$

$$-2\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}\,\sqrt{10}$$

$$+2\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}\,\sqrt{10}$$

$$-2\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}+24\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)$$

$$+2\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}+56\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)$$

$$-12\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{10}-20\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{10}\right)\Bigg/\left(\left(\sqrt{8-2\sqrt{10}}\right.\right.$$

$$-\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)^{2}\sqrt{8-2\sqrt{10}}\right)+\left(\frac{1}{10}\,\mathrm{I}\left(\left(8-2\sqrt{10}\right)^{3/2}\sin\left(\sqrt{8}\right.\right.$$

$$-8\sin\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}\right)\right)\Bigg/\left(\left(\sqrt{8-2\sqrt{10}}\right.\right.$$

$$-\sqrt{8+2\sqrt{10}}\right)\left(\sqrt{8-2\sqrt{10}}+\sqrt{8+2\sqrt{10}}\right)^{2}\sqrt{8-2\sqrt{10}}\right)$$

$$xx_2 := 0.137\cos(1.30\,t)-0.0373\cos(3.78\,t) \tag{14}$$

> $EcuaOrig := simplify(eval(diff(x[1](t), t\$2) = -4\cdot x[1](t) + 6\cdot(x[2](t) - x[1](t))))$

$$EcuaOrig := -\frac{9}{20}\left(\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}\,\sqrt{10}\right. \tag{15}$$

$$+\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}\,\sqrt{10}$$

$$-2\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}$$

$$+2\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{8-2\sqrt{10}}\,\sqrt{8+2\sqrt{10}}+12\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)\sqrt{10}$$

$$+4\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)\sqrt{10}-36\cos\left(\sqrt{8-2\sqrt{10}}\;t\right)-4\cos\left(\sqrt{8+2\sqrt{10}}\;t\right)\right)\Bigg/$$

$$\left(\sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10} + 8\sqrt{10} - 20 \right) =$$

$$- \frac{9}{20} \left(\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10} \right.$$

$$+ \cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10}$$

$$- 2\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}}$$

$$+ 2\cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} + 12\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) \sqrt{10}$$

$$\left. + 4\cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \sqrt{10} - 36\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) - 4\cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \right) \Big/$$

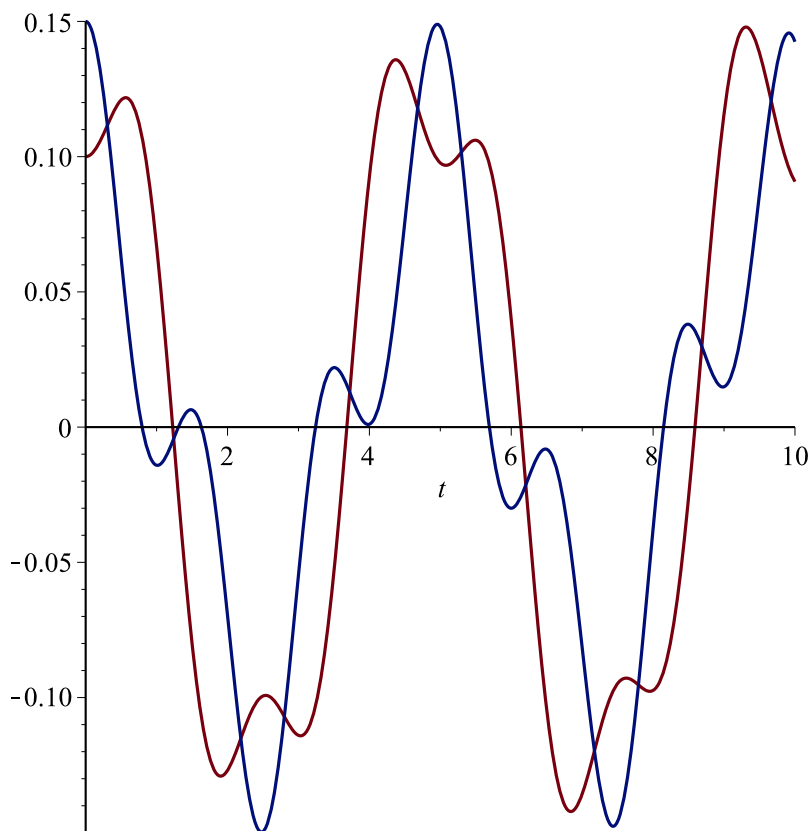$$\left(\sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10} + 8\sqrt{10} - 20 \right)$$

> $EcuaOrigDos := simplify(eval(diff(x[2](t), t\$2) = -6 \cdot (x[2](t) - x[1](t))))$

$EcuaOrigDos := \dfrac{3}{20} \left(\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10} \right.$ **(16)**

$$+ \cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10}$$

$$- 8\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}}$$

$$+ 8\cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} + 24\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) \sqrt{10}$$

$$\left. - 8\cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \sqrt{10} - 84\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) + 44\cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \right) \Big/$$

$$\left(\sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10} + 8\sqrt{10} - 20 \right)$$

$$= \frac{3}{20} \left(\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10} \right.$$

$$+ \cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10}$$

$$- 8\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}}$$

$$+ 8\cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} + 24\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) \sqrt{10}$$

$$\left. - 8\cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \sqrt{10} - 84\cos\!\left(\sqrt{8 - 2\sqrt{10}} \; t \right) + 44\cos\!\left(\sqrt{8 + 2\sqrt{10}} \; t \right) \right) \Big/$$

$$\left(\sqrt{8 - 2\sqrt{10}} \; \sqrt{8 + 2\sqrt{10}} \; \sqrt{10} + 8\sqrt{10} - 20 \right)$$

> $plot(\{x[1](t), x[2](t)\}, t = 0 .. 10)$

> *restart*

> $AA := array([[0, -50], [200, -200]])$

$$AA := \begin{bmatrix} 0 & -50 \\ 200 & -200 \end{bmatrix}$$

(17)

> $BB := array([60 \cos(60\,t), 0])$

$$BB := \begin{bmatrix} 60 \cos(60\,t) & 0 \end{bmatrix}$$

(18)

> $Xcero := array([0, 0])$

$$Xcero := \begin{bmatrix} 0 & 0 \end{bmatrix}$$

(19)

> $with(linalg)$:

> $MatExp := exponential(AA, t)$

$$MatExp := \begin{bmatrix} e^{-100\,t} + 100\,t\,e^{-100\,t} & -50\,t\,e^{-100\,t} \\ 200\,t\,e^{-100\,t} & e^{-100\,t} - 100\,t\,e^{-100\,t} \end{bmatrix}$$

(20)

> $SolHom := evalm(MatExp \,\&^* Xcero)$

$$SolHom := \begin{bmatrix} 0 & 0 \end{bmatrix}$$

(21)

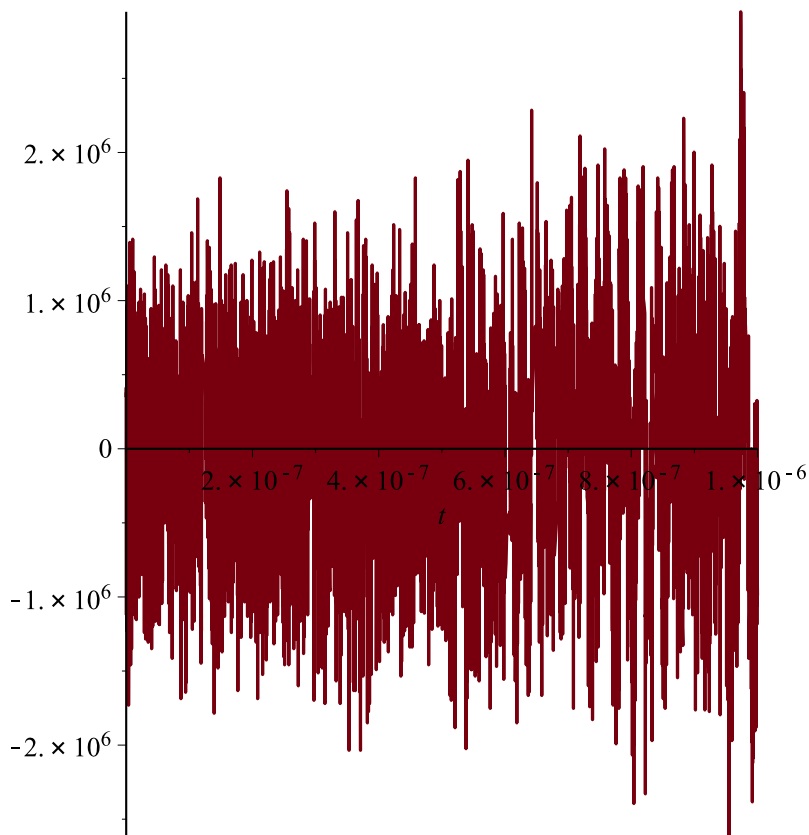> $MatExpTau := map(rcurry(eval, t = 't - tau'), MatExp)$
$MatExpTau :=$ **(22)**

$$\begin{bmatrix} e^{-100\,t\,+\,100\,\tau} + 100\,(t - \tau)\,e^{-100\,t\,+\,100\,\tau} & -50\,(t - \tau)\,e^{-100\,t\,+\,100\,\tau} \\ 200\,(t - \tau)\,e^{-100\,t\,+\,100\,\tau} & e^{-100\,t\,+\,100\,\tau} - 100\,(t - \tau)\,e^{-100\,t\,+\,100\,\tau} \end{bmatrix}$$

> $BBtau := map(rcurry(eval, t = 'tau'), BB)$
$$BBtau := \begin{bmatrix} 60\,\cos(60\,\tau) & 0 \end{bmatrix} \qquad\qquad\qquad \textbf{(23)}$$

> $ProdTau := evalm(MatExpTau \,\&* \,BBtau)$
$ProdTau := \big[\, 60\,\big(e^{-100\,t\,+\,100\,\tau} + 100\,(t - \tau)\,e^{-100\,t\,+\,100\,\tau}\big)\,\cos(60\,\tau),\ 12000\,(t$ **(24)**
        $- \tau)\,e^{-100\,t\,+\,100\,\tau}\,\cos(60\,\tau)\,\big]$

> $SolNoHom := map(int, ProdTau, tau = 0..t)\,:$
> $plot(SolNoHom[1], t = 0..0.000001)$

> $plot(SolNoHom[2], t = 0..0.000001)$

> *restart*

> $AA := array([[0,-50],[200,-200]])$

$$AA := \begin{bmatrix} 0 & -50 \\ 200 & -200 \end{bmatrix} \qquad \text{(25)}$$

> $BB := array([60,0])$

$$BB := \begin{bmatrix} 60 & 0 \end{bmatrix} \qquad \text{(26)}$$

> $Xcero := array([0,0])$

$$Xcero := \begin{bmatrix} 0 & 0 \end{bmatrix} \qquad \text{(27)}$$

> $with(linalg):$

> $MatExp := exponential(AA,t)$

$$MatExp := \begin{bmatrix} e^{-100\,t} + 100\,t\,e^{-100\,t} & -50\,t\,e^{-100\,t} \\ 200\,t\,e^{-100\,t} & e^{-100\,t} - 100\,t\,e^{-100\,t} \end{bmatrix} \qquad \text{(28)}$$

> $SolHom := evalm(MatExp \,\&*\, Xcero)$

$$SolHom := \begin{bmatrix} 0 & 0 \end{bmatrix} \qquad \text{(29)}$$

> $MatExpTau := map(rcurry(eval, t ='t - tau'), MatExp)$
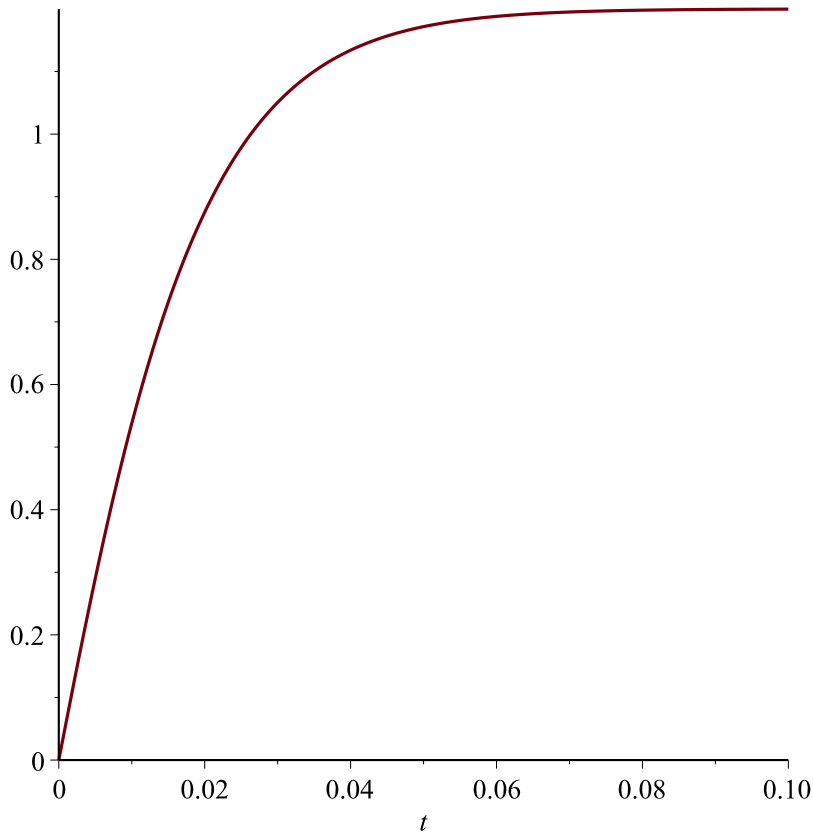$MatExpTau :=$ **(30)**

$$\begin{bmatrix} e^{-100t+100\tau} + 100\,(t-\tau)\,e^{-100t+100\tau} & -50\,(t-\tau)\,e^{-100t+100\tau} \\ 200\,(t-\tau)\,e^{-100t+100\tau} & e^{-100t+100\tau} - 100\,(t-\tau)\,e^{-100t+100\tau} \end{bmatrix}$$

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

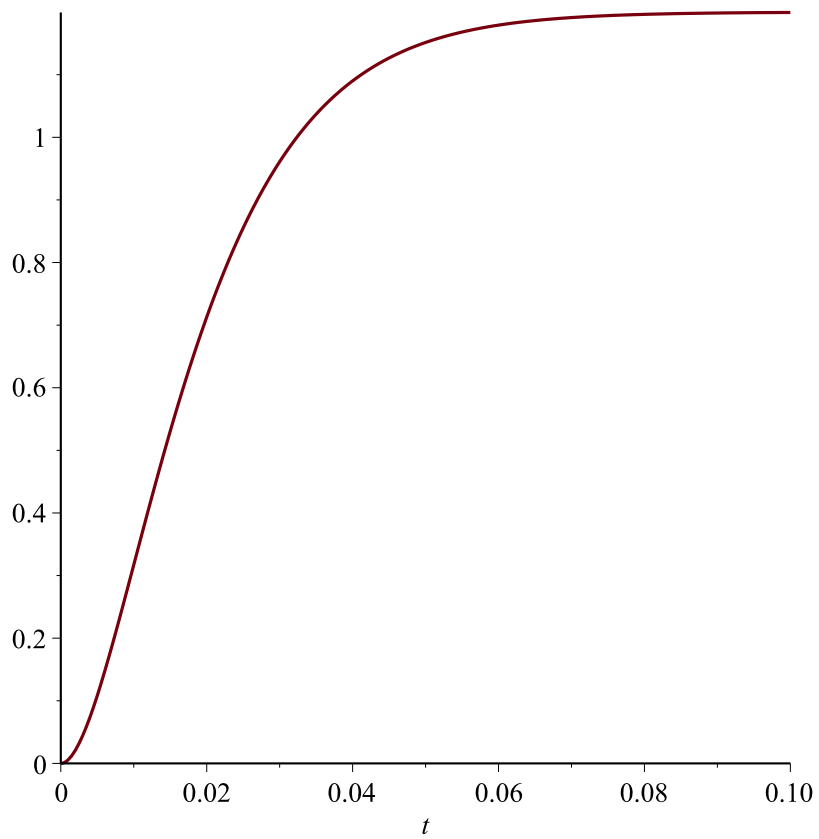$$BBtau := \begin{bmatrix} 60 & 0 \end{bmatrix} \qquad\qquad\text{(31)}$$

> $ProdTau := evalm(MatExpTau \, \&* \, BBtau)$

$$ProdTau := \begin{bmatrix} 60\,e^{-100t+100\tau} + 6000\,(t-\tau)\,e^{-100t+100\tau} & 12000\,(t-\tau)\,e^{-100t+100\tau} \end{bmatrix} \quad\text{(32)}$$

> $SolNoHom := map(int, ProdTau, tau = 0 ..t) : evalf(\%, 3)$

$$\begin{bmatrix} -60.\,t\,e^{-100.t} - 1.20\,e^{-100.t} + 1.20 & -120.\,t\,e^{-100.t} - 1.20\,e^{-100.t} + 1.20 \end{bmatrix} \quad\text{(33)}$$

> $plot(SolNoHom[1], t = 0 ..0.1)$

> $plot(SolNoHom[2], t = 0 ..0.1)$

> $plot(SolNoHom[1] - SolNoHom[2], t = 0..0.1)$