```
> restart
```

$$\frac{dy_1}{dt} = 2y_1 + 3y_2 + 5e^{2t} \qquad y_1(0) = 3$$

$$\frac{dy_2}{dt} = y_1 + 4y_2 - 6e^{-t} \qquad y_2(0) = -2$$

```
> Sistema := diff(y1(t), t) = 2·y1(t) + 3·y2(t) + 5·exp(2 t), diff(y2(t), t) = y1(t) + 4·y2(t)
      − 6·exp(−t) : Sistema1; Sistema2
```

$$\frac{d}{dt} y_1(t) = 2\,y_1(t) + 3\,y_2(t) + 5\,e^{2t}$$

$$\frac{d}{dt} y_2(t) = y_1(t) + 4\,y_2(t) - 6\,e^{-t} \qquad \textbf{(1)}$$

```
> Condiciones := y1(0) = 3, y2(0) = −2
```

$$Condiciones := y_1(0) = 3,\ y_2(0) = -2 \qquad \textbf{(2)}$$

```
> Solucion := dsolve({Sistema, Condiciones}) : Solucion1; Solucion2
```

$$y_1(t) = \frac{9}{4}\,e^{t} - \frac{13}{12}\,e^{5t} + \frac{10}{3}\,e^{2t} - \frac{3}{2}\,e^{-t}$$

$$y_2(t) = -\frac{3}{4}\,e^{t} - \frac{13}{12}\,e^{5t} + \frac{3}{2}\,e^{-t} - \frac{5}{3}\,e^{2t} \qquad \textbf{(3)}$$

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

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

```
> Ycero := array([3, −2])
```

$$Ycero := \begin{bmatrix} 3 & -2 \end{bmatrix} \qquad \textbf{(5)}$$

```
> Btau := array([5·exp(2·tau), −6·exp(−tau)])
```

$$Btau := \begin{bmatrix} 5\,e^{2\tau} & -6\,e^{-\tau} \end{bmatrix} \qquad \textbf{(6)}$$

```
> with(linalg) :
> MatExp := exponential(AA, t)
```

$$MatExp := \begin{bmatrix} \frac{3}{4}\,e^{t} + \frac{1}{4}\,e^{5t} & \frac{3}{4}\,e^{5t} - \frac{3}{4}\,e^{t} \\ \frac{1}{4}\,e^{5t} - \frac{1}{4}\,e^{t} & \frac{1}{4}\,e^{t} + \frac{3}{4}\,e^{5t} \end{bmatrix} \qquad \textbf{(7)}$$

```
> MatExpTau := exponential(AA, t − tau)
```

$$MatExpTau := \begin{bmatrix} \frac{3}{4}e^{t-\tau} + \frac{1}{4}e^{5t-5\tau} & \frac{3}{4}e^{5t-5\tau} - \frac{3}{4}e^{t-\tau} \\ \frac{1}{4}e^{5t-5\tau} - \frac{1}{4}e^{t-\tau} & \frac{1}{4}e^{t-\tau} + \frac{3}{4}e^{5t-5\tau} \end{bmatrix} \quad (8)$$

> $MatBtau := simplify(evalm(MatExpTau \&* Btau)) : MatBtau_1; MatBtau_2$

$$\frac{15}{4}e^{\tau+t} + \frac{5}{4}e^{-3\tau+5t} - \frac{9}{2}e^{-6\tau+5t} + \frac{9}{2}e^{-2\tau+t}$$

$$\frac{5}{4}e^{-3\tau+5t} - \frac{5}{4}e^{\tau+t} - \frac{3}{2}e^{-2\tau+t} - \frac{9}{2}e^{-6\tau+5t} \quad (9)$$

> $IntMatBtau := map(int, MatBtau, \tau = 0..t) : IntMatBtau_1; IntMatBtau_2$

$$-\frac{3}{2}e^{t} - \frac{1}{3}e^{5t} + \frac{10}{3}e^{2t} - \frac{3}{2}e^{-t}$$

$$-\frac{1}{3}e^{5t} + \frac{1}{2}e^{t} - \frac{5}{3}e^{2t} + \frac{3}{2}e^{-t} \quad (10)$$

> $Ceros := map(rcurry(eval, t='0'), IntMatBtau)$

$$Ceros := \begin{bmatrix} 0 & 0 \end{bmatrix} \quad (11)$$

> $SOL := evalm(evalm(MatExp \&* Ycero) + IntMatBtau) : yy_1(t) = SOL_1; yy_2(t) = SOL_2$

$$yy_1(t) = \frac{9}{4}e^{t} - \frac{13}{12}e^{5t} + \frac{10}{3}e^{2t} - \frac{3}{2}e^{-t}$$

$$yy_2(t) = -\frac{3}{4}e^{t} - \frac{13}{12}e^{5t} + \frac{3}{2}e^{-t} - \frac{5}{3}e^{2t} \quad (12)$$

> $Solucion_1; Solucion_2$

$$y_1(t) = \frac{9}{4}e^{t} - \frac{13}{12}e^{5t} + \frac{10}{3}e^{2t} - \frac{3}{2}e^{-t}$$

$$y_2(t) = -\frac{3}{4}e^{t} - \frac{13}{12}e^{5t} + \frac{3}{2}e^{-t} - \frac{5}{3}e^{2t} \quad (13)$$

>