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

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

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

$$MatExp := \begin{bmatrix} e^t \cos(t) & e^t \sin(t) \\ -e^t \sin(t) & e^t \cos(t) \end{bmatrix} \tag{2}$$

```
> DerMatExp := map(diff, MatExp, t)
```

$$DerMatExp := \begin{bmatrix} e^t \cos(t) - e^t \sin(t) & e^t \sin(t) + e^t \cos(t) \\ -e^t \sin(t) - e^t \cos(t) & e^t \cos(t) - e^t \sin(t) \end{bmatrix} \tag{3}$$

```
> MatOrig := map(rcurry(eval, t ='0'), DerMatExp)
```

$$MatOrig := \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} \tag{4}$$

```
> Xcero := array([8, -8])
```

$$Xcero := \begin{bmatrix} 8 & -8 \end{bmatrix} \tag{5}$$

```
> Solucion := evalm(MatExp &* Xcero) : xx(t) = Solucion₁; yy(t) = Solucion₂
```

$$xx(t) = 8\,e^t \cos(t) - 8\,e^t \sin(t)$$
$$yy(t) = -8\,e^t \sin(t) - 8\,e^t \cos(t) \tag{6}$$

```
> Sistema := diff(x(t), t) = x(t) + y(t), diff(y(t), t) = -x(t) + y(t) : Sistema₁; Sistema₂
```

$$\frac{d}{dt}\,x(t) = x(t) + y(t)$$

$$\frac{d}{dt}\,y(t) = -x(t) + y(t) \tag{7}$$

```
> Condiciones := x(0) = 8, y(0) = -8
```

$$Condiciones := x(0) = 8, y(0) = -8 \tag{8}$$

```
> SolPart := dsolve({Sistema, Condiciones}) : SolPart₁; SolPart₂
```

$$x(t) = e^t\,(-8 \sin(t) + 8 \cos(t))$$
$$y(t) = -e^t\,(8 \cos(t) + 8 \sin(t)) \tag{9}$$

```
> Comprobacion₁ := simplify(eval(subs(x(t) = rhs(SolPart₁), y(t) = rhs(SolPart₂),
      lhs(Sistema₁) − rhs(Sistema₁) = 0)))
```

$$Comprobacion_1 := 0 = 0 \tag{10}$$

```
> Comprobacion₂ := simplify(eval(subs(x(t) = rhs(SolPart₁), y(t) = rhs(SolPart₂),
      lhs(Sistema₂) − rhs(Sistema₂) = 0)))
```

$$Comprobacion_2 := 0 = 0 \tag{11}$$

```
> restart
```

> $AA := array([[1, 1], [2, 2]])$

$$AA := \begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix} \qquad (12)$$

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

$$MatExp := \begin{bmatrix} \dfrac{2}{3} + \dfrac{1}{3}\,e^{3t} & \dfrac{1}{3}\,e^{3t} - \dfrac{1}{3} \\[2ex] \dfrac{2}{3}\,e^{3t} - \dfrac{2}{3} & \dfrac{1}{3} + \dfrac{2}{3}\,e^{3t} \end{bmatrix} \qquad (13)$$

> $Xcero := array([x_0, y_0])$

$$Xcero := \begin{bmatrix} x_0 & y_0 \end{bmatrix} \qquad (14)$$

> $SolGral := evalm(MatExp \,\&*\, Xcero): x(t) = SolGral_1; y(t) = SolGral_2$

$$x(t) = \left(\frac{2}{3} + \frac{1}{3}\,e^{3t} \right) x_0 + \left(\frac{1}{3}\,e^{3t} - \frac{1}{3} \right) y_0$$

$$y(t) = \left(\frac{2}{3}\,e^{3t} - \frac{2}{3} \right) x_0 + \left(\frac{1}{3} + \frac{2}{3}\,e^{3t} \right) y_0 \qquad (15)$$

> $Sistema := diff(x(t), t) = x(t) + y(t), diff(y(t), t) = 2 \cdot x(t) + 2 \cdot y(t): Sistema_1; Sistema_2$

$$\frac{d}{dt}\,x(t) = x(t) + y(t)$$

$$\frac{d}{dt}\,y(t) = 2\,x(t) + 2\,y(t) \qquad (16)$$

> $SolucionGeneral := dsolve(\{Sistema\}): SolucionGeneral_1; SolucionGeneral_2$

$$x(t) = \_C1 + \_C2\,e^{3t}$$

$$y(t) = 2\,\_C2\,e^{3t} - \_C1 \qquad (17)$$

>