$$\boxed{\dot{x} + x = 0} \quad \text{sol. gral.} \quad x(t) = Ce^{-t}$$

$$\boxed{\begin{array}{l} \dot{x} + \lambda x = 0 \\ x(0) = C_0 \end{array}} \quad \begin{array}{l} \text{sol. gral.} \quad x(t) = Ce^{-\lambda t} \\ \Rightarrow Ce^{-0(t)} = C_0 \Rightarrow C = C_0 \Rightarrow x(t) = C_0 e^{-\lambda t} \text{ es sol. part.} \end{array}$$

$$\boxed{\begin{array}{l} \dot{x}_1 + \lambda_1 x_1 = 0 \\ \dot{x}_2 + \lambda_2 x_2 = 0 \end{array}} \quad \text{sol. gral.} \quad \begin{pmatrix} x_1(t) \\ x_2(t) \end{pmatrix} = \begin{pmatrix} C_1 e^{-\lambda_1 t} \\ C_2 e^{-\lambda_2 t} \end{pmatrix} \quad \begin{array}{c} A\vec{x} = \dot{\vec{x}} \\ \begin{pmatrix} -\lambda_1 & 0 \\ 0 & -\lambda_2 \end{pmatrix}\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \end{pmatrix} \end{array}$$

sistema desacoplado

$$\boxed{\begin{array}{l} \dot{x}_1 + \lambda_1 x_1 = 0 \\ \vdots \\ \dot{x}_n + \lambda_n x_n = 0 \end{array}} \quad \begin{pmatrix} x_1(t) = C_1 e^{-\lambda_1 t} \\ \vdots \\ x_n(t) = C_n e^{-\lambda_n t} \end{pmatrix} \quad \begin{pmatrix} -\lambda_1 & 0 & \cdots & 0 \\ 0 & -\lambda_2 & 0 \cdots & 0 \\ \vdots & & \ddots & \vdots \\ 0 & \cdots & 0 & -\lambda_n \end{pmatrix}\begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix} = \begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \vdots \\ \dot{x}_n \end{pmatrix}$$

$$\dot{\vec{x}} = A\vec{x} \qquad \begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \end{pmatrix} = \overbrace{\begin{pmatrix} 1 & 2 \\ 3 & 2 \end{pmatrix}}^{A = [T]_\beta}\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \qquad \det(A - \lambda I) = 0 = \begin{vmatrix} 1-\lambda & 2 \\ 3 & 2-\lambda \end{vmatrix} = (1-\lambda)(2-\lambda) - 6$$

$$\Rightarrow \lambda^2 - 3\lambda - 4 = 0 = (\lambda - 4)(\lambda - (-1)) \Rightarrow \lambda_1 = 4, \ \lambda_2 = -1. \qquad [\vec{v}_1]_\beta = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

$$(A - \lambda_1 I)\begin{pmatrix} u_1 \\ u_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \Rightarrow \begin{pmatrix} -3 & 2 \\ 3 & -2 \end{pmatrix}\begin{pmatrix} u_1 \\ u_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \Rightarrow \begin{array}{l} -3u_1 + 2u_2 = 0 \\ \cancel{3u_1 - 2u_2 = 0} \end{array} \Rightarrow u_1 = \frac{2}{3}u_2 \Rightarrow \begin{pmatrix} \frac{2}{3}u_2 \\ u_2 \end{pmatrix}$$

$$(A - \lambda_2 I)\begin{pmatrix} w_1 \\ w_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \Rightarrow \begin{pmatrix} 2 & 2 \\ 3 & 3 \end{pmatrix}\begin{pmatrix} w_1 \\ w_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \Rightarrow \begin{array}{l} 2w_1 + 2w_2 = 0 \\ \cancel{3w_1 + 3w_2 = 0} \end{array} \Rightarrow w_1 = -w_2 \Rightarrow \begin{pmatrix} -w_2 \\ w_2 \end{pmatrix} \Rightarrow [\vec{v}_2]_\beta = \begin{pmatrix} -1 \\ 1 \end{pmatrix}.$$

$$\gamma = (\vec{v}_1, \vec{v}_2) \text{ es b.o. de } \mathbb{R}^2. \qquad \begin{pmatrix} -4 & 0 \\ 0 & 1 \end{pmatrix} = [T]_\gamma = [I]_\beta^\gamma [T]_\beta [I]_\gamma^\beta$$

$$\begin{pmatrix} 2 & -1 \\ 3 & 1 \end{pmatrix}$$

$$\left.\begin{array}{l} y_1 = C_1 e^{4t} \\ y_2 = C_2 e^{-t} \end{array}\right\} \quad \vec{x} = \begin{pmatrix} 2 & -1 \\ 3 & 1 \end{pmatrix}\begin{pmatrix} C_1 e^{4t} \\ C_2 e^{-t} \end{pmatrix} \Rightarrow \begin{array}{l} x_1 = 2C_1 e^{4t} - C_2 e^{-t} \\ x_2 = 3C_1 e^{4t} + C_2 e^{-t} \end{array}$$