$$\frac{dx_1(t)}{dt} = x_2(t) \qquad x_1(0) = 5$$

$$\frac{dx_2(t)}{dt} = -x_1(t) \qquad x_2(0) = -5$$

$$\frac{d^2x_1(t)}{dt^2} = -x_1(t)$$

EDO(2)LCCH $$\frac{d^2x_1(t)}{dt^2} + x_1(t) = 0$$

$$m^2 + 1 = 0$$

$$m_1 = i \quad m_2 = -i$$

$$x_1(t) = c_1 \cos(t) + c_2 \operatorname{sen}(t)$$

$$x_2(t) = -c_1 \operatorname{sen}(t) + c_2 \cos(t)$$

$$x_1(0) \Rightarrow 5 = c_1(1) + c_2(0) \rightarrow c_1 = 5$$

$$x_2(0) \Rightarrow -5 = -(5)(0) + c_2(1) \rightarrow c_2 = -5$$

$$(+)\begin{cases} x_1(t) = 5\cos(t) - 5\operatorname{sen}(t) \\ x_2(t) = -5\cos(t) - 5\operatorname{sen}(t) \end{cases}$$

$$\frac{d}{dt}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} \qquad \bar{x}(0) = \begin{bmatrix} 5 \\ -5 \end{bmatrix}$$

$$\boxed{\begin{array}{l} \frac{d}{dt}\bar{x} = A\bar{x} \qquad \bar{x}(0) \\ \bar{x} = e^{At}\,\bar{x}(0) \end{array}}$$

$$e^{At} = B_0(t)\,\underline{I} + B_1(t)\,A$$

$$\det(A - \lambda I) = 0 \quad \text{ecuación característica.}$$

$$\begin{vmatrix} -\lambda & 1 \\ -1 & -\lambda \end{vmatrix} = 0 \Rightarrow \lambda^2 + 1 = 0 \qquad \begin{array}{l} \lambda_1 = i \\ \lambda_2 = -i \end{array}$$

$$\left.\begin{array}{l} e^{it} = B_0 + iB_1 \\ e^{-it} = B_0 - iB_1 \end{array}\right\} \Rightarrow \begin{array}{l} \cos(t) + i\,\mathrm{sen}(t) = B_0 + iB_1 \\ \cos(t) - i\,\mathrm{sen}(t) = B_0 - iB_1 \end{array}$$

$$\begin{array}{l} B_0 = \cos(t) \\ B_1 = \mathrm{sen}(t) \end{array}$$

$$e^{At} = \cos(t)\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + \mathrm{sen}(t)\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

$$e^{At} = \begin{bmatrix} \cos(t) & \mathrm{sen}(t) \\ -\mathrm{sen}(t) & \cos(t) \end{bmatrix}$$

$$e^{A(0)} = \underline{I} \qquad e^{A(0)} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\underline{\frac{d}{dt}e^{At} = Ae^{At}}$$

$$\frac{d}{dt}e^{At} = \begin{bmatrix} -\mathrm{sen}(t) & \cos(t) \\ -\cos(t) & -\mathrm{sen}(t) \end{bmatrix}$$

$$Ae^{At} = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \times \begin{bmatrix} \cos(t) & \mathrm{sen}(t) \\ -\mathrm{sen}(t) & \cos(t) \end{bmatrix}$$

$$= \begin{bmatrix} -\mathrm{sen}(t) & \cos(t) \\ -\cos(t) & -\mathrm{sen}(t) \end{bmatrix}$$

$$\bar{x} \Rightarrow \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} = \begin{bmatrix} \cos(t) & \mathrm{sen}(t) \\ -\mathrm{sen}(t) & \cos(t) \end{bmatrix}\begin{bmatrix} 5 \\ -5 \end{bmatrix}$$

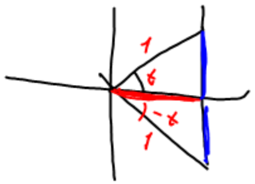
$$\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} = \begin{bmatrix} 5\cos(t) - 5\,\mathrm{sen}(t) \\ -5\,\mathrm{sen}(t) - 5\cos(t) \end{bmatrix}$$

$$e^{At} \longrightarrow e^{A(0)} = I$$

$$\frac{d}{dt} e^{A(t)} = A\, e^{A(t)}$$

$$\left[e^{A(t)}\right]^{-1} = \left[e^{A(-t)}\right]$$

$$e^{At} = \begin{bmatrix} \cos(t) & \operatorname{sen}(t) \\ -\operatorname{sen}(t) & \cos(t) \end{bmatrix} \qquad \left[e^{A(t)}\right]^{-1} = \begin{bmatrix} \cos(t) & -\operatorname{sen}(t) \\ \operatorname{sen}(t) & \cos(t) \end{bmatrix}$$



$$\boxed{e^{At} \Rightarrow A}$$

$$\underbrace{\begin{bmatrix} \cos(t) & \operatorname{sen}(t) \\ -\operatorname{sen}(t) & \cos(t) \end{bmatrix}}_{e^{At}} \times \underbrace{\begin{bmatrix} \cos(t) & -\operatorname{sen}(t) \\ \operatorname{sen}(t) & \cos(t) \end{bmatrix}}_{\left[e^{At}\right]^{-1}}$$

$$\begin{bmatrix} \cos^2(t) + \operatorname{sen}^2(t) & -\cos(t)\operatorname{sen}(t) + \operatorname{sen}(t)\cos(t) \\ -\cos(t)\operatorname{sen}(t) + \operatorname{sen}(t)\cos(t) & \operatorname{sen}^2(t) + \cos^2(t) \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\frac{d}{dt}\bar{x} = A\bar{x} + \bar{b}(t)$$

S(n) EDO(1)LCC NH

$$\frac{dx_1(t)}{dt} = 2x_1(t) + 3x_2(t) + t + 4t^2 + 8e^{2t}$$

$$\frac{dx_2(t)}{dt} = x_1(t) + 4x_2(t) + 3e^{2t} + 4$$

$$\frac{d}{dt}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} t + 4t^2 + 8e^{2t} \\ 3e^{2t} + 4 \end{bmatrix}$$

$$\frac{d}{dt}\bar{x} = A \cdot \bar{x} + \bar{b}(t)$$

$$\bar{x} = e^{At}\bar{x}(0) + \int_0^t e^{A(t-\tau)} b(\tau)\, d\tau.$$