2ª parte TEMA 3.

RESOLVER SISTEMAS DE EDOL.

$$\frac{dx(t)}{dt} = 2x(t) + 3y(t)$$

$$\frac{dy(t)}{dt} = x(t) + 4y(t).$$

S(2) $\boxed{\text{EDOL}(1)\text{CC}}$ H

$$x(t) = \frac{dy(t)}{dt} - 4y(t)$$

$$\frac{d}{dt}\left(\quad \frac{dx(t)}{dt} = \frac{d^2y(t)}{dt^2} - 4\frac{dy(t)}{dt}\right.$$

$$\left[\frac{d^2y(t)}{dt^2} - 4\frac{dy}{dt}(t)\right] = 2\left[\frac{dy(t)}{dt} - 4y(t)\right] + 3y(t)$$

$$\frac{d^2y(t)}{dt^2} - 6\frac{dy(t)}{dt} + 5y(t) = 0 \quad \text{EDOL}(2)\text{CC H.}$$

$$m^2 - 6m + 5 = 0$$

$$(m-5)(m-1) = 0 \qquad m_1 = 1,\ m_2 = 5$$

$$y(t) = C_1 e^{t} + C_2 e^{5t}$$

$$\frac{dy(t)}{dt} = C_1 e^{t} + 5C_2 e^{5t}$$

$$x(t) = \left(C_1 e^{t} + 5C_2 e^{5t}\right) - 4\left(C_1 e^{t} + C_2 e^{5t}\right)$$

SG
$$\boxed{\begin{aligned} x(t) &= -3C_1 e^{t} + C_2 e^{5t} \\ y(t) &= C_1 e^{t} + C_2 e^{5t} \end{aligned}}$$

$x(0) = 3$

$y(0) = -4$

$$x(0) \Rightarrow 3 = -3C_1 + C_2$$

$$y(0) \Rightarrow -4 = C_1 + C_2$$

$$7 = -4C_1 + (0) \qquad C_1 = \frac{-7}{4}$$

$$-4 = -\frac{7}{4} + C_2$$

$$C_2 = -4 + \frac{7}{4} \Rightarrow \qquad C_2 = -\frac{9}{4}$$

SP
$$\boxed{\begin{aligned} x(t) &= \frac{21}{4}e^{t} - \frac{9}{4}e^{5t} \\ y(t) &= -\frac{7}{4}e^{t} - \frac{9}{4}e^{5t} \end{aligned}}$$

$x(t) \quad y(t)$

$$\begin{cases} \frac{dx}{dt} = 2x + 3y \\ \frac{dy}{dt} = x + 4y \end{cases} \qquad \bar{x}(t) = \begin{bmatrix} x \\ y \end{bmatrix}$$

$$\begin{bmatrix} \frac{dx}{dt} \\ \frac{dy}{dt} \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} \qquad \dot{\bar{x}}(t) = \begin{bmatrix} \frac{dx}{dt} \\ \frac{dy}{dt} \end{bmatrix}$$

$$A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$$

$$\boxed{\dot{\bar{x}} = A\bar{x}} \qquad \left[e^{At}\right]$$

$$\bar{x}(0) = \begin{bmatrix} c_1 \\ c_2 \end{bmatrix}$$

$$\bar{x}(t) = \left[e^{At}\right] \bar{x}(0)$$

$$\bar{x}(0) = \begin{bmatrix} 3 \\ -4 \end{bmatrix}$$

$$\frac{d}{dt}\bar{x}(t) = A e^{At} \cdot \bar{x}(0)$$

$$A\left[e^{At}\right]\bar{x}(0) = A\left(\left[e^{At}\right]\bar{x}(0)\right)$$

$$0 \equiv 0$$

$$\left[e^{At}\right]_{t=0} = I. \qquad \left[e^{At}\right]$$

$$\frac{d}{dt}\left[e^{At}\right] = A \times \left[e^{At}\right] \longleftarrow$$

$$\left[e^{At}\right] \times \left[e^{At}\right]^{-1} = I.$$

$$\left[e^{At}\right] \times \left[e^{A(-t)}\right] = I.$$

$$e^{t} = 1 + t + \frac{t^2}{2!} + \frac{t^3}{3!} + \ldots + \frac{t^k}{k!} + \ldots$$

$$e = 2{,}72 \ldots$$

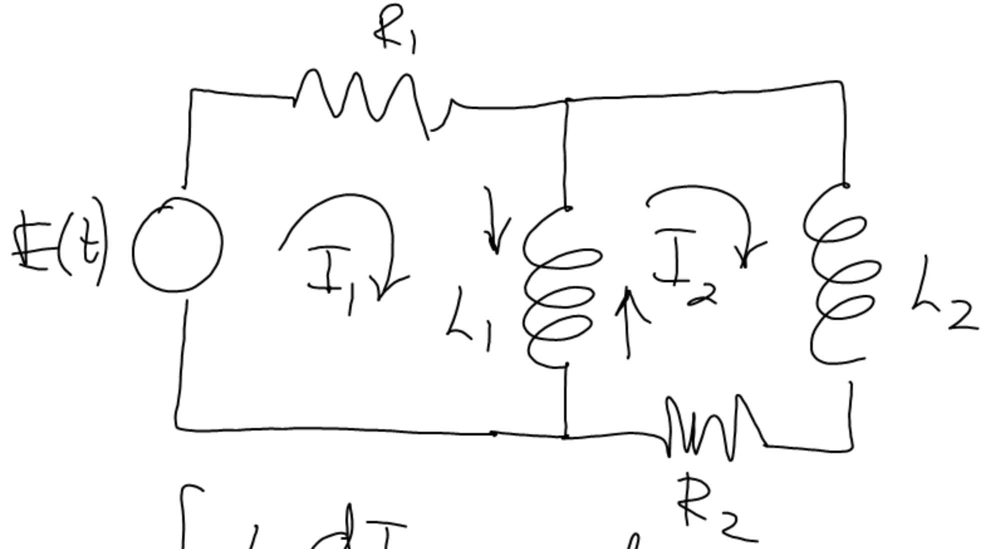
$$e^{At} = I + At + \frac{A^2}{2!}t^2 + \frac{A^3}{3!}t^3 + \ldots + \frac{A^k}{k!}t^k + \ldots$$

$$A = \quad \det(A - \lambda I) = 0$$

$$\lambda^n + a_1\lambda^{n-1} + a_2\lambda^{n-2} + \ldots + a_n = 0$$

$$A^n + a_1 A^{n-1} + a_2 A^{n-2} + \ldots + a_n I = [0]$$

$$A^n = -a_n I - a_{n-1} A - \ldots - a_2 A^{n-2} - a_1 A^{n-1}$$



$$\begin{cases} L_1 \dfrac{dI_1}{dt} - L_1 \dfrac{dI_2}{dt} + R_1 I_1 = E(t) \\ -L_1 \dfrac{dI_1}{dt} + L_1 \dfrac{dI_2}{dt} + R_2 I_2 = 0 \end{cases}$$

$$\frac{dI_1}{dt} = a_{11} I_1 + a_{12} I_2 + b_1(t)$$

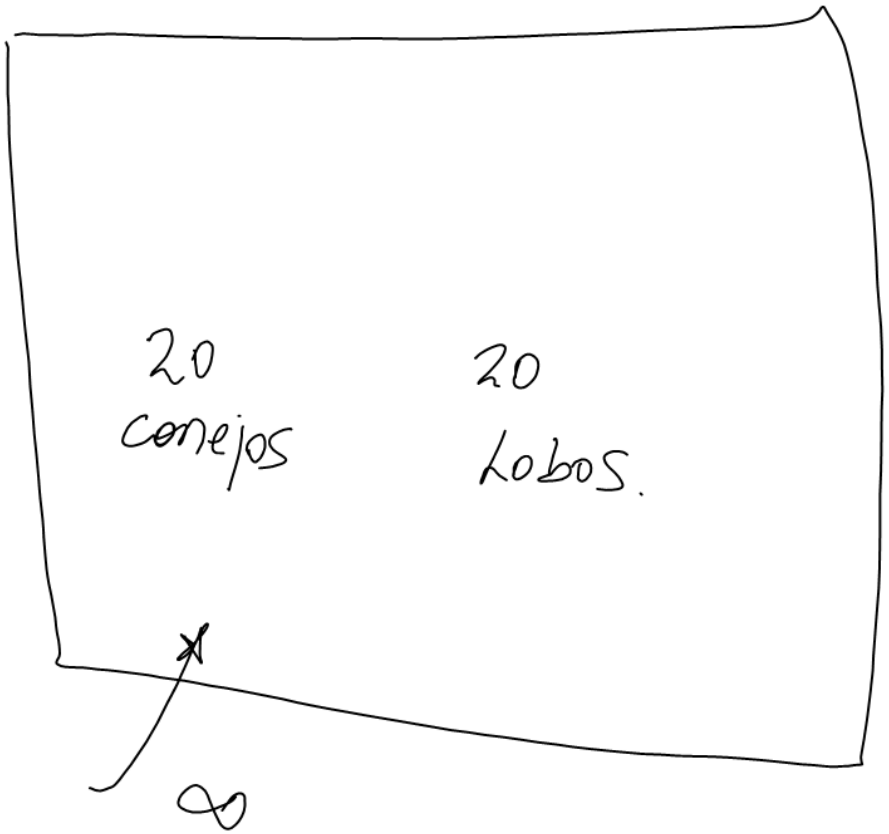
$$\frac{dI_2}{dt} = a_{21} I_1 + a_{22} I_2 + b_2(t)$$

$$\begin{bmatrix} \frac{dx_1}{dt} \\ \frac{dx_2}{dt} \\ \frac{dx_3}{dt} \end{bmatrix} = \begin{bmatrix} 1 & 3 & 2 \\ -4 & 8 & 2 \\ 2 & 6 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 3e^{2t} \\ 4e^{t} \\ 5e^{3t} \end{bmatrix}$$

$$\bar{b}(t)$$

$$\dot{\bar{x}} = A\bar{x} + \bar{b}(t)$$

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



$$\frac{dC}{dt} = a_{11} C - a_{12} C L$$

$$\frac{dL}{dt} = -a_{21} L + a_{22} C L$$