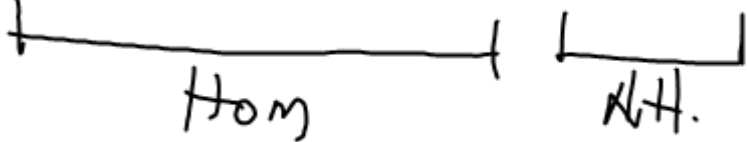


# TEMA 3b) SISTEMAS DE ECUACIONES DIFERENCIALES LINEALES.

$$\frac{dx_1}{dt} = a_{11}x_1 + a_{12}x_2 + b_1(t)$$

$$\frac{dx_2}{dt} = a_{21}x_1 + a_{22}x_2 + b_2(t)$$



$$\text{I } \frac{dx_1}{dt} = 2x_1 + 3x_2$$

$$\text{II } \frac{dx_2}{dt} = x_1 + 4x_2$$

$S(z) \in \text{EDO}(1) \text{ LCC}$

De II desptto  $x_1$

$$\frac{d}{dt} \left( \begin{array}{l} x_1 = \frac{dx_2}{dt} - 4x_2 \\ \frac{dx_1}{dt} = \frac{d^2x_2}{dt^2} - 4\frac{dx_2}{dt} \end{array} \right)$$

$$\frac{d^2x_2}{dt^2} - 4\frac{dx_2}{dt} = 2\left(\frac{dx_2}{dt} - 4x_2\right) + 3x_2$$

$$\frac{d^2x_2}{dt^2} - 6\frac{dx_2}{dt} + 5x_2 = 0 \quad \text{EDO}(2) \text{ LCC}$$

$$(D^2 - 6D + 5)x_2 = 0$$

$$(D-1)(D-5)x_2 = 0$$

$$\frac{d}{dt} \left( \begin{array}{l} x_2 = c_1 e^t + c_2 e^{5t} \\ \frac{dx_2}{dt} = c_1 e^t + 5c_2 e^{5t} \end{array} \right)$$

$$x_1 = (c_1 e^t + 5c_2 e^{5t}) - 4(c_1 e^t + c_2 e^{5t})$$

$$x_1 = -3c_1 e^t + c_2 e^{5t}$$

$$x_2 = c_1 e^t + c_2 e^{5t}$$

SOL. GRAL

SISTEMA.

$$\frac{d^3 y}{dt^3} - 6 \frac{d^2 y}{dt^2} + 4 \frac{dy}{dt} - 2y = 0$$

$$y = y_1$$

$$\frac{dy}{dt} = \frac{dy_1}{dt} = y_2$$

$$\frac{d^2 y}{dt^2} = \frac{dy_2}{dt} = y_3$$

$$\frac{d^3 y}{dt^3} = \frac{dy_3}{dt} = 2y_1 - 4y_2 + 6y_3$$

$$\frac{dx_1}{dt} = a_{11}x_1 + a_{12}x_2 + b_1(t)$$

$$\frac{dx_2}{dt} = a_{21}x_1 + a_{22}x_2 + b_2(t)$$

$$\bar{b} = \begin{bmatrix} b_1(t) \\ b_2(t) \end{bmatrix} \quad \bar{x} = \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} \quad \frac{d\bar{x}}{dt} = \begin{bmatrix} \frac{dx_1(t)}{dt} \\ \frac{dx_2(t)}{dt} \end{bmatrix}$$

$$\begin{bmatrix} \frac{dx_1(t)}{dt} \\ \frac{dx_2(t)}{dt} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} b_1(t) \\ b_2(t) \end{bmatrix}$$

$$\frac{d}{dt}\bar{x} = A\bar{x}$$

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

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

$$[e^{At}]_{t=0} = I.$$

$$[e^{At}]^{-1} = [e^{A(-t)}]$$

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