



# Linealidad EDO

$$\frac{d^n y}{dx^n} + a_1(x) \frac{d^{n-1} y}{dx^{n-1}} + a_2(x) \frac{d^{n-2} y}{dx^{n-2}} + \dots + a_n \frac{dy}{dx} + a_n y = Q(x)$$

FORMA GENERAL EDO(n) Lineal.

$$\frac{dy}{dx} + y^2 = 0 \quad \text{EDO(1) NL}$$

$$\frac{dy}{dx} = \frac{x}{y} \quad y \frac{dy}{dx} = x \quad \text{EDO(1) NL}$$

$$\frac{d^2 \theta}{dt^2} + a_1 \sin(\theta) = 0 \quad \text{EDO(2) NL.}$$

$$\frac{d^2 \theta}{dt^2} + a_1 \theta = 0 \quad \text{EDO(2) L.} \quad \sin(\theta) \doteq \theta \quad 0 \leq \theta \leq 4^\circ$$

EDO

$$\left\{ \begin{array}{l} \text{LINEALES} \\ Q(x) = 0 \\ \text{EDO}(3) \sim \text{H.} \\ \text{CV} \end{array} \right\} \left\{ \begin{array}{l} 1^{\text{er}} \text{ orden} \\ \text{orden sup.} \end{array} \right\} \left\{ \begin{array}{l} \text{Homogeneas} \\ \text{No-homog.} \end{array} \right\} \left\{ \begin{array}{l} \text{CV} \\ \text{CC} \end{array} \right\}$$

$$\text{EDO}(3) \sim \text{H.} \quad \frac{d^3 y}{dx^3} - 3x^2 \frac{d^2 y}{dx^2} + \frac{4}{x} \frac{dy}{dx} + 6y = 0$$

$$Q(x) \neq 0 \quad \text{EDO}(1) \sim \text{NH.} \quad \frac{dy}{dx} + \frac{y}{x^2} = 5e^{2x}$$

CV

$$-H \cdot s = M \frac{d^2 s}{dt^2} \quad s(t)$$

$$M \frac{d^2 s}{dt^2} + H s = 0$$

$$\boxed{\frac{d^2 s}{dt^2} + \frac{H}{M} s = 0} \quad \text{EDO}(2) \sim \text{HCC}$$

$$\frac{d^2 y}{dx^2} + 6 \frac{dy}{dx} + 8y = 6x^2 + 4e^{2x} + \cos(3x)$$

EDO(2) L NH CC

EDO(3) L NH CV

→  $\frac{d^n y}{dx^n}$   
 $y^{(n)}_x$   
 $\frac{d^n y}{dx^n}$   
 $y^{(n)}_x$

EDO(2) LCC NH

$$\frac{d^2 y}{dx^2} + 8 \frac{dy}{dx} + 9y = e^{2x}$$

$$\frac{d^4 z(x)}{dx^4} - 2 \frac{d^2 z(x)}{dx^2} + 5z(x) = 0$$

EDO(4) LCC H.

$$y(x) = C_1 e^{-3x} + C_2 e^{2x}$$

$$\frac{dy}{dx} = -3C_1 e^{-3x} + 2C_2 e^{2x}$$

$$\frac{d^2 y}{dx^2} = 9C_1 e^{-3x} + 4C_2 e^{2x}$$

$$\frac{d^2 y}{dx^2} + 3 \frac{dy}{dx} = 10C_2 e^{2x}$$

$$C_2 = \frac{1}{10e^{2x}} \left( \frac{d^2 y}{dx^2} + 3 \frac{dy}{dx} \right)$$

$$\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} = 15C_1 e^{-3x}$$

$$C_1 = \frac{1}{15e^{-3x}} \left( \frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} \right)$$

$$y(x) = \int \frac{1}{15e^{-3x}} \left( \frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} \right) e^{-3x} + \frac{1}{10e^{2x}} \left( \frac{d^2 y}{dx^2} + 3 \frac{dy}{dx} \right) e^{2x}$$

$$= \frac{1}{15} \left( \frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} \right) + \frac{1}{10} \left( \frac{d^2 y}{dx^2} + 3 \frac{dy}{dx} \right)$$

$$30y(x) = 2 \left( \frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} \right) + 3 \left( \frac{d^2 y}{dx^2} + 3 \frac{dy}{dx} \right)$$

$$30y(x) = 5 \frac{d^2 y}{dx^2} + 5 \frac{dy}{dx}$$

$$\frac{d^2 y}{dx^2} + \frac{dy}{dx} - 6y(x)$$

$$\frac{d^2 y}{dx^2} + \frac{dy}{dx} - 6y(x) = 0$$

$$\text{EDO}(2) \text{ LccH.}$$

$$\frac{d^2 y}{dx^2} + y = 6x^2$$

$$y_{g/NH} = c_1 y_1 + c_2 y_2 + y_p$$