EDO(n)L

$$a_0(x)\frac{d^n y}{dx^n} + a_1(x)\frac{d^{n-1}y}{dx^{n-1}} + \dots + a_{n-1}(x)\frac{dy}{dx} + a_n(x)y = Q(x)$$

LINEALES: $\begin{cases} \text{HOMOGÉNEAS} \\ \text{NO-HOMOGÉNEAS} \end{cases}$ $\begin{cases} \text{Coeficientes Variable} \\ \text{Coeficientes constantes} \end{cases}$

* $\begin{cases} \text{Si } Q(x) = 0 \text{ — homogénea} \\ \text{Si } Q(x) \neq 0 \text{ — no-homogénea} \end{cases}$

* $\begin{cases} \forall i \in \mathbb{I} \quad \forall a_i(x) = k_i \quad \text{coef. const.} \\ \text{una } a_i(x) \neq k_i \quad \text{coef. Variables.} \end{cases}$

$$\frac{d^2y}{dx^2} - x\frac{dy}{dx} + x^2 y = 8\cos(2x).$$

EDO(2) L. cv. N-H.

$$\frac{dy}{dx} = y \Rightarrow \frac{dy}{dx} - y = 0$$

EDO(1) L. cc. H.

$$\frac{dy}{dx} - \frac{y}{x} = 0$$

$a_0(x) = 1 \quad a_1(x) = -\frac{1}{x} \quad Q(x) = 0$

EDO(1) L. CV. H.

$$\frac{d^3y}{dt^3} - 5\frac{d^2y}{dt^2} + 4\frac{dy}{dt} - 6y = 8e^{2t} + t^2$$

EDO(3) L. cc. NH.

EDO(1)L cc H.

$$a_0\frac{dy}{dx}+a_1 y=0$$

Regla de Oro.: El coeficiente de la derivada de mayor orden debe ser siempre la unidad.

$$\frac{dy}{dx}+\frac{a_1}{a_0}y=0 \longrightarrow \frac{dy}{dx}+k_1 y=0$$

$$\frac{dy}{dx}=-k_1 y \longrightarrow dy=-k_1 y\,dx$$

$$\frac{dy}{y}=-k_1 dx$$

$$\int\frac{dy}{y}=-k_1\int dx$$

$$\longrightarrow Ly+C_1=-k_1(x+C_2)$$

$$Ly=-k_1 x+(-k_1C_2-C_1)$$

$$y=e^{(-k_1x+(-k_1C_2-C_1))}$$

$$y=e^{(-k_1C_2-C_1)}\cdot e^{-k_1x}$$

EDO(1)L cc H.

$$\boxed{\frac{dy}{dx}+k_1 y=0}$$

$$\boxed{y=Ce^{-k_1x}}$$

SOLUCIÓN GENERAL

$$\frac{dy}{dx} + \sqrt{3}\,y = 0 \longrightarrow y = Ce^{-\sqrt{3}x}$$

$$\frac{dy}{dx} - \frac{y}{2} = 0 \longrightarrow y = Ce^{\frac{1}{2}x}$$

$$\frac{dy}{dx} + my = 0 \longrightarrow y = Ce^{-mx}$$

$$y = Ce^{5x} \longrightarrow \frac{dy}{dx} - 5y = 0$$

$$\frac{d^2y}{dx^2} + a_1\frac{dy}{dx} + a_2 y = 0 \quad EDO(2)L \text{ co } H.$$

$$\frac{dy}{dx} - my = 0 \longrightarrow y = Ce^{mx}$$

y_{PF}

$$y = c_1 y_1 + c_2 y_2$$

$$\boxed{y_{PF} = e^{mx}} \rightarrow \frac{dy}{dx} = e^{mx}\cdot m \rightarrow \frac{dy}{dx} = me^{mx}$$

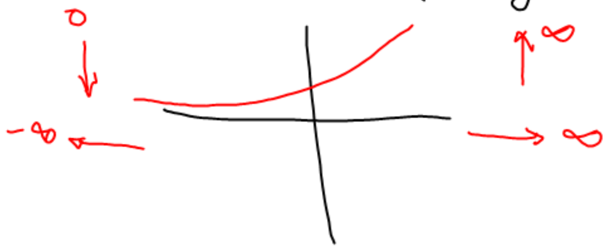
$$\frac{d^2y}{dx^2} = m\cdot\left(me^{mx}\right) \longrightarrow \frac{d^2y}{dx^2} = m^2e^{mx}$$

$$\frac{d^2y}{dx^2} + a_1\frac{dy}{dx} + a_2 y = 0$$

$$\left[m^2e^{mx}\right] + a_1\left[me^{mx}\right] + a_2\left[e^{mx}\right] = 0$$

$$(m^2 + a_1 m + a_2)e^{mx} = 0 \quad EA$$

$e^{mx} = 0 \quad \forall x, \quad y = 0$ trivial $EDO(n)L$.



$$\frac{d^2y}{dx^2} + a_1 \frac{dy}{dx} + a_2 y = 0$$ EDO(2)L cc H.

si $y_p = e^{mx}$

$$m^2 + a_1 m + a_2 = 0$$ $\left\{\right.$ ECUACIÓN CARACTERÍSTICA.

$\left.\begin{matrix} m_1 \\ m_2 \end{matrix}\right\}$ raíces solución.

$$m_1^2 + a_1 m_1 + a_2 = 0 \longrightarrow 0 \equiv 0$$

$$m_2^2 + a_1 m_2 + a_2 = 0 \longrightarrow 0 \equiv 0$$

$$y_{PF} = e^{m_1 x} \qquad y_{PF} = e^{m_2 x}$$

$$y_g = c_1 e^{m_1 x} + c_2 e^{m_2 x}$$

H.

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0 \qquad y = e^{mx}$$

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

$$(m-2)(m-3) = 0$$

$$m_1 = 2 \qquad y = e^{2x}$$

$$m_2 = 3 \qquad y = e^{3x}$$

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0 \qquad y = e^{2x}$$

$$\frac{dy}{dx} = 2e^{2x} \qquad \frac{d^2y}{dx^2} = 4e^{2x}$$

$$\left[4e^{2x}\right] - 5\left[2e^{2x}\right] + 6\left[e^{2x}\right] = 0$$

$$(4 - 10 + 6)e^{2x} = 0 \qquad 0 \equiv 0$$

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0 \qquad y = e^{3x}$$

$$\frac{dy}{dx} = 3e^{3x} \qquad \frac{d^2y}{dx^2} = 9e^{3x}$$

$$\left[9e^{3x}\right] - 5\left[3e^{3x}\right] + 6\left[e^{3x}\right] = 0$$

$$(9 - 15 + 6)e^{3x} = 0 \qquad \underline{\underline{0 \equiv 0}}$$

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0 \qquad y = e^{x}$$

$$\frac{dy}{dx} = e^{x} \qquad \frac{d^2y}{dx^2} = e^{x}$$

$$\left[e^{x}\right] - 5\left[e^{x}\right] + 6\left[e^{x}\right] = 0$$

$$(1 - 5 + 6)e^{x} = 0$$

$$2e^{x} \neq 0.$$

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$$

$$y_G = C_1 e^{2x} + C_2 e^{3x}$$

$$y_G = C_1 e^{-4x} + C_2 e^{-3x} + C_3 e^{-2x}$$

$$(m+4)(m+3)(m+2) = 0$$

$$(m+4)(m^2+5m+6) = 0$$

$$m^3 + 9m^2 + 26m + 24 = 0$$

$$\frac{d^3y}{dx^3} + 9\frac{d^2y}{dx^2} + 26\frac{dy}{dx} + 24y = 0$$

EDO(3)LCcH

$$\frac{d^2y}{dx^2} + a_1 \frac{dy}{dx} + a_2 y = 0 \quad EDO(2)L\ cc\ H.$$

$$m^2 + a_1 m + a_2 = 0 \quad \left\{ \begin{array}{l} m_1 \\ m_2 \end{array} \right.$$

$$y = c_1 e^{m_1 x} + c_2 e^{m_2 x}$$

$$W = \begin{vmatrix} e^{m_1 x} & e^{m_2 x} \\ m_1 e^{m_1 x} & m_2 e^{m_2 x} \end{vmatrix} \neq 0$$

$$m_2 e^{m_2 x} e^{m_1 x} - m_1 e^{m_1 x} e^{m_2 x} \neq 0$$

$$(m_2 - m_1) e^{m_1 x} e^{m_2 x} \neq 0 \qquad e^{m_1 x} \neq 0$$

$$e^{m_2 x} \neq 0$$

$$(m_2 - m_1) \neq 0 \qquad m_2 \neq m_1$$

$$m^2 + 2m + 1 = 0$$

$$(m+1)^2 = 0 \quad m_1 = m_2 = -1$$

$$y = c_1 e^{-x} + c_2 e^{-x} \Rightarrow (c_1 + c_2) e^{-x}$$

$$y = c_3 e^{-x}$$

$$m^2 + a_1 m + a_2 = 0 \qquad m_1 = m_2$$

$$(m - m_1)^2 = 0$$

$$\frac{\partial}{\partial m}$$

$$2(m - m_1) = 0$$

$$2m + a_1 = 0$$

$$m_1 \neq m_2$$

$$m^2 + a_1 m + a_2 = 0$$

$$(m - m_1)(m - m_2) = 0$$

$$(m - m_1) + (m - m_2) = 0$$

$$e^{mx} \xrightarrow{m = m_1} e^{m_1 x}$$

$$\frac{\partial}{\partial m}$$

$$x e^{mx} \xrightarrow{m = m_1} x e^{m_1 x}$$

$$\frac{d^2y}{dx^2} + a_1 \frac{dy}{dx} + a_2 y = 0$$

$$m^2 + a_1 m + a_2 = 0 \qquad m_1 = m_2$$

$$y = x e^{m_1 x}$$

$$\frac{dy}{dx} = m_1 x e^{m_1 x} + e^{m_1 x}$$

$$\frac{d^2y}{dx^2} = m_1^2 x e^{m_1 x} + 2m_1 e^{m_1 x}$$

$$\left[m_1^2 x e^{m_1 x} + 2m_1 e^{m_1 x}\right] + a_1\left[m_1 x e^{m_1 x} + e^{m_1 x}\right] + a_2\left[x e^{m_1 x}\right] = 0$$

$$\left(m_1^2 + a_1 m_1 + a_2\right) x e^{m_1 x} + \left(2m_1 + a_1\right) e^{m_1 x} = 0$$

$$(0)\, x e^{m_1 x} + (0)\, e^{m_1 x} = 0$$

$$\underline{0 = 0}$$

$$\frac{d^2y}{dx^2} + a_1 \frac{dy}{dx} + a_2 y = 0$$

$$m^2 + a_1 m + a_2 = 0 \qquad m_1 = m_2$$

$$\boxed{y_g = C_1 e^{m_1 x} + C_2 x e^{m_1 x}}$$

$$\frac{d^2y}{dx^2} = 0 \qquad \text{EDO(2)L cc H.}$$

$$m^2 = 0 \qquad m_1 = m_2 = 0$$

$$y = C_1 e^{m_1 x} + C_2 x e^{m_1 x}$$

$$\boxed{y = C_1 + C_2 x}$$