ECUACIÓN LINEAL

EDOL(n) CV NH

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

primer orden $n=1$

EDOL(1) CV NH

$$a_0(x)\frac{dy}{dx} + a_1(x)\, y = Q(x)$$

normalizando

$$\frac{dy}{dx} + \frac{a_1(x)}{a_0(x)}\, y = \frac{Q(x)}{a_0(x)}$$

$$\boxed{\frac{dy}{dx} + p(x)\, y = q(x)}$$

$$\frac{dy}{dx}+p(x)y=q(x)$$

homogénea $q(x)=0$

EDOL(1) cv H

$$\frac{dy}{dx}+p(x)y=0$$

$$y_g=c_1e^{-\int p(x)dx}$$

$$\frac{dy}{dx}-\frac{y}{x^2}=0 \Rightarrow p(x)=-\frac{1}{x^2}$$

$$\int p(x)dx=-\int\frac{dx}{x^2}\Rightarrow-\int x^{-2}dx\Rightarrow-\frac{x^{-1}}{(-1)}\Rightarrow x^{-1}$$

$$-\int p(x)dx=-\frac{1}{x} \qquad y_g=c_1e^{\left(-\frac{1}{x}\right)}$$

$$\frac{dy}{dx} - \frac{1}{x^2} y = 0 \qquad y_g = C_1 e^{\left(-\frac{1}{x}\right)}$$

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

$$\left[\frac{C_1}{x^2} e^{-\frac{1}{x}} \right] - \frac{1}{x^2} \left[C_1 e^{-\frac{1}{x}} \right] = 0$$

$$(C_1 - C_1) \frac{1}{x^2} e^{-\frac{1}{x}} = 0$$

$$(0) \frac{1}{x^2} e^{-\frac{1}{x}} = 0$$

$$\underline{0 = 0}$$

$$\frac{dy}{dx} + p(x)y = 0$$

$p(x) = a_1 \qquad a_1 \in \mathbb{R}$

EDOL(1) cc H

$$\frac{dy}{dx} + a_1 y = 0 \Rightarrow y_g = c_1 e^{-a_1 x}$$

$$\frac{dy}{dx} - \sqrt{3}\, y = 0 \Rightarrow y_g = c_1 e^{+\sqrt{3}x}$$

$$\frac{dy}{dx} + a_1 y = q(x)$$

$$\frac{dy}{dx} + p(x) y = q(x)$$

$$y_g = c_1 e^{-\int p(x)dx} + e^{-\int p(x)dx}\left[\int e^{\int p(x)dx} q(x)\,dx\right]$$

$$y_g = c_1 e^{-a_1 x} + e^{-a_1 x}\left[\int e^{a_1 x} q(x)\,dx\right]$$

$$\frac{dy}{dx} + 4y = 3e^{3x}$$

$$\frac{dy}{dx} + a_1 y = 0 \Rightarrow y(x) = C_1 e^{-a_1 x}$$

$$\frac{dy}{dx} + a_1 y = q(x) \Rightarrow y(x) = C_1 e^{-a_1 x} + \left[e^{-a_1 x} \int e^{a_1 x} q(x)\, dx \right]$$

$$y(x) = \left[C_1 + \int e^{a_1 x} q(x)\, dx \right] e^{-a_1 x}$$

$$y(x) = A(x)\, e^{-a_1 x}$$

$$y_{g/H} = C_1 y_1 \qquad y_{g/NH} = C_1 y_1 + f(x) y_1$$

$$\boxed{y_{g/NH} = y_{g/H} + y_{p/q}}$$

REGLA DE ORO

$$y_g = C_1 e^{-5x} + 4e^{x} + x^2$$

$g(x)$

$$y_h = C_1 e^{-a_1 x} \longrightarrow \frac{dy}{dx} + a_1 y = 0$$

$$y = C_1 e^{-5x} \longrightarrow \frac{dy}{dx} + 5y = 0$$

$$y_p = 4e^{x} + x^2$$

$$\frac{dy}{dx} = 4e^{x} + 2x$$

$$g(x) = \left[4e^{x} + 2x\right] + 5\left[4e^{x} + x^2\right]$$

$$g = 24e^{x} + 5x^2 + 2x$$

$$\frac{dy}{dx} + 5y = 24e^{x} + 5x^2 + 2x$$