EDO(1)L

EDO(1)L cc H.

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

EDO(1)L cv H.

$$\frac{dy}{dx} + p(x) y = 0 \longrightarrow y_g = c_1 e^{-\int p(x)dx}$$

$$\frac{d}{dx}\left(y e^{\int p(x)dx}\right) = 0 \leftarrow y e^{\int p(x)dx} = c_1$$

$$y \frac{d}{dx} e^{\int p(x)dx} + e^{\int p(x)dx} \cdot (1) \cdot \frac{dy}{dx} = 0$$

$$y e^{\int p(x)dx} p(x) + e^{\int p(x)dx} \cdot \frac{dy}{dx} = 0$$

$$e^{\int p(x)dx}\left(\frac{dy}{dx} + p(x) y\right) = 0$$

FACTOR INTEGRANTE.

$$\frac{dy}{dx} + p(x) y = 0 \qquad \text{EDO(1)L cv H.}$$

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

$$\frac{d}{dx}\left(y e^{\int p(x)dx}\right) = 0$$

$$y e^{\int p(x)dx} = c_1$$

$$\boxed{y = c_1 e^{-\int p(x)dx}}$$

EDO(1)L CV NH.

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

Método del Factor Integrante.

$$e^{\int p(x)dx}\left(\frac{dy}{dx} + p(x)y\right) = e^{\int p(x)dx} q(x)$$

$$\frac{d}{dx}\left(ye^{\int p(x)dx}\right) = e^{\int p(x)dx} q(x)$$

Método de Separación de Variables

$$d\left(ye^{\int p(x)dx}\right) = e^{\int p(x)dx} q(x)\, dx$$

$$u = ye^{\int p(x)dx}$$

$$du = e^{\int p(x)dx} q(x)\, dx$$

$$\int du = \int e^{\int p(x)dx} q(x)\, dx$$

$$u + k_1 = \left[\int e^{\int p(x)dx} q(x)\, dx\right] + k_2$$

$$u = (k_2 - k_1) + \int e^{\int p(x)dx} q(x)\, dx$$

$$u = C_1 + \int e^{\int p(x)dx} q(x)\, dx$$

$$ye^{\int p(x)dx} = C_1 + \int e^{\int p(x)dx} q(x)\, dx$$

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

EDO(1)L CV NH.

REGLA DE ORO LINEALES

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

178. $x \ln x \cdot y' - y = x^3 (3 \ln x - 1)$.

$$x L x \frac{dy}{dx} - y = x^3 (3 L x - 1)$$

$$\frac{dy}{dx} - \frac{y}{x L x} = \frac{x^3}{x L x}(3 L x - 1)$$

$$\frac{dy}{dx} + \left(\frac{-1}{x L x}\right) y = 3x^2 - \frac{x^2}{L x}$$

$$p(x) = -\frac{1}{x L x}$$

$$q(x) = 3x^2 - \frac{x^2}{L x}$$

$$y_g = C_1 e^{-\int p(x)dx} + e^{-\int p(x)dx} \int e^{\int p(x)dx} q(x)\, dx$$

$$\int p(x)dx = \int \left(-\frac{1}{x L x}\right) dx$$

$$= -\int \frac{\frac{dx}{x}}{L x} \qquad u = L x \quad du = \frac{dx}{x}$$

$$= -\int \frac{du}{u} \Rightarrow -L u$$

$$\int p(x)dx = -L(L x)$$

$$e^{\int p(x)dx} = e^{-L(L x)} \Rightarrow e^{L(L x)^{-1}}$$

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

$$e^{-\int p(x)dx} = e^{L(L x)}$$

$$= L x$$

$$y_g = C_1 L x + L x \int \frac{1}{L x}\left(3x^2 - \frac{x^2}{L x}\right) dx$$

$$\int u\,dv = uv - \int v\,du$$

$$\int \frac{3x^2 - \frac{x^2}{L x}}{L x} dx \Rightarrow 3\int \frac{x^2}{L x} dx - \int \frac{x^2}{L x^2} dx$$

$$3\int \frac{x^2}{L x} dx \qquad u = (L x)^{-1} \quad du = -(L x)^{-2}\frac{dx}{x}$$

$$\text{II} \qquad dV = x^2 dx \quad V = \frac{x^3}{3}$$

$$3\left(\frac{x^3}{3}(L x)^{-1} + \int \frac{x^3}{(L x)^2 3} dx\right) \Rightarrow \frac{x^3}{L x} + \int \frac{x^2}{(L x)^{+2}} dx$$

$$\int \quad dx = \frac{x^3}{L x} + \cancel{\int \frac{x^2}{(L x)^2} dx} - \cancel{\int \frac{x^2}{(L x)^2} dx}$$

$$y = C_1 L x + L x \left(\frac{x^3}{L x}\right)$$

$$\boxed{y = C_1 L x + x^3} \qquad x L x \frac{dy}{dx} - y = x^3 (3 L x - 1)$$

EDO(1)L cc NH.

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

$$y_g = C_1 e^{-a_1 x} + e^{-a_1 x} \int e^{a_1 x} q(x)\,dx$$

$$y_{g/NH} = C_1 e^{-a_1 x} + e^{-a_1 x} \int e^{a_1 x} q(x)\,dx$$

$$y_{g/H} = C_1 e^{-a_1 x}$$

$$y_{g/NH} = \left(C_1 + \int e^{a_1 x} q(x)\,dx \right) e^{-a_1 x}$$

$$y_{g/NH} = A(x)\, e^{-a_1 x}$$

$$y_{g/H} = C_1 e^{-a_1 x}$$

Método de Parámetros Variables

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

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

homogénea asociada

$$y = c_1 e^{-a_1 x}$$

$$y_{NH} = A(x) e^{-a_1 x}$$

$$\frac{dy}{dx} = -a_1 A(x) e^{-a_1 x} + e^{-a_1 x} A'(x)$$

$$\left[-a_1 A(x) e^{-a_1 x} + e^{-a_1 x} A'(x)\right] + a_1 \left[A(x) e^{-a_1 x}\right] = q(x)$$

$$\cancel{-a_1 A(x) e^{-a_1 x}} + e^{-a_1 x} A'(x) + \cancel{a_1 A(x) e^{-a_1 x}} = q(x)$$

$$e^{-a_1 x} A'(x) = q(x)$$

$$A'(x) = e^{a_1 x} q(x)$$

$$\frac{d}{dx} A(x) = e^{a_1 x} q(x)$$

$$\int dA(x) = \int e^{a_1 x} q(x)\, dx$$

$$A(x) + k_3 = \left[\int e^{a_1 x} q(x)\, dx\right] + k_4$$

$$A(x) = (k_4 - k_3) + \int e^{a_1 x} q(x)\, dx$$

$$A(x) = c_1 + \int e^{a_1 x} q(x)\, dx$$

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

$$y = c_1 e^{-a_1 x} + e^{-a_1 x} \int e^{a_1 x} q(x)\, dx$$

182. $y' = \dfrac{1}{x \operatorname{sen} y + 2 \operatorname{sen} 2y}$.

$$\frac{dy}{dx} = \frac{1}{x \operatorname{sen}(y) + 2 \operatorname{sen}(2y)}$$

EDO(1) NL

$$\frac{dx}{dy} = x \operatorname{sen}(y) + 2 \operatorname{sen}(2y)$$

$$\frac{dx}{dy} - \operatorname{sen}(y)\, x = 2 \operatorname{sen}(2y)$$

EDO(1) L cv NH.

$$p(y) = -\operatorname{sen}(y)$$

$$q(y) = 2 \operatorname{sen}(2y)$$

$$X(y) = C_1 e^{-\int p(y)\,dy} + e^{-\int p(y)\,dx} \int e^{\int p(y)\,dx} q(y)\,dy.$$