CAPÍTULO II. EDO(n)L.

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

FORMA GENERAL LINEAL (Coeficientes Variables / No homogenea)

$n=1 \Rightarrow$ primer orden

$$a_0(x)\frac{dy}{dx} + a_1(x)y = Q(x) \quad \text{EDO(1)L CV. NH.}$$

normalizar

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

$$\boxed{\frac{dy}{dx} + p(x)\cdot y = q(x)} \quad \text{EDO(1)L. CV. NH.}$$

$q(x)=0$

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

$p(x) = a_1$

$$\boxed{\frac{dy}{dx} + a_1 y = 0} \quad \text{EDO(1)L. CC. H.}$$

¿Cuál será la Solución General EDO(1)L cc H.?

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

$$\frac{dy}{dx} = -a_1 y$$

método separación de variables

$$dy = \left(-a_1 y\right) dx$$

$$\frac{dy}{y} = -a_1 dx$$

$$\int \frac{dy}{y} = -a_1 \int dx$$

$$\ell y + k_1 = -a_1 (x + k_2)$$

despejar "y"

$$\ell y = -a_1 x + (-a_1 k_2 - k_1)$$

$$y = e^{-a_1 x + (-a_1 k_2 - k_1)}$$

$$y = e^{-a_1 k_2 - k_1} \cdot e^{-a_1 x}$$

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

SOLUCIÓN GENERAL EDO(1)L cc H

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

$$\boxed{e^{mx}}$$

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

$$\boxed{y_p = e^{mx}}$$ prototipo.

$$\frac{dy}{dx} = e^{mx} \cdot m = me^{mx}$$

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

$$(m + a_1)e^{mx} = 0$$

$y = 0$ sea solución trivial de las lineales.

$$\boxed{m + a_1 = 0}$$ característica

$$m = -a_1$$

$e^{-a_1 x}$ sol. part. fund.

$$\boxed{y_g = c_1 e^{-a_1 x}}$$

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

MSV.

$$\frac{dy}{y} = -p(x)\,dx$$

$$\int \frac{dy}{y} = -\int p(x)\,dx$$

$$\ln y + k_1 = \left[-\int p(x)\,dx\right] + k_2$$

$$\ln y = \left[-\int p(x)\,dx\right] + (k_2 - k_1)$$

$$y = \underbrace{e^{(k_2-k_1)}} \cdot e^{-\int p(x)\,dx}$$

$$\boxed{y = C_1 e^{-\int p(x)\,dx}}$$

SG - EDO(1)L CV H.

$$\frac{dy}{dx} - \frac{y}{x} = 0 \Rightarrow \frac{dy}{dx} + \left(-\frac{1}{x}\right)y = 0$$

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

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

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

$$= \int \frac{dx}{x}$$

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

$$y_g = c_1 e^{\ln x}$$

$$\left\{\begin{array}{l} u = e^{\ln x} \\ \ln u = \ln e^{\ln x} \\ \ln u = \ln x \cancel{\ln e}^{\,1} \\ \ln u = \ln x \\ u = x. \end{array}\right.$$

$$\boxed{y_g = c_1 x}$$

$$\frac{dy}{dx} = c_1$$

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

$$[c_1] - \frac{(c_1 \cancel{x})}{\cancel{x}} = 0$$

$$c_1 - c_1 = 0$$

$$\underline{\underline{0 = 0}}$$

$$\frac{dy}{dx} + xy = 0$$

$$p(x) = x$$

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

$$\boxed{y_g = c_1 e^{-\frac{x^2}{2}}}$$

$$\frac{dy}{dx} + xy = 0$$

$$\frac{dy}{dx} = c_1 e^{-\frac{x^2}{2}} \cdot (-x)$$

$$\left[-c_1 x e^{-\frac{x^2}{2}}\right] + x\left(c_1 e^{-\frac{x^2}{2}}\right) = 0$$

$$(-c_1 + c_1) x e^{-\frac{x^2}{2}} = 0$$

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

$$0 \equiv 0$$

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

$$p(x) = \cos(x)$$

$$-\int p(x)\,dx = -\int \cos(x)\,dx$$

$$= -\operatorname{sen}(x)$$

$$y_g = C_1 e^{-\operatorname{sen}(x)}$$

$$\frac{dy}{dx} = C_1 e^{-\operatorname{sen}(x)}\left(-\cos(x)\right)$$

$$\left[-C_1 \cos(x) e^{-\operatorname{sen}(x)}\right] + \cos(x)\left[C_1 e^{-\operatorname{sen}(x)}\right] = 0$$

$$(-C_1 + C_1)\cos(x) e^{-\operatorname{sen}(x)} = 0$$

$$(0)\cos(x) e^{-\operatorname{sen}(x)} = 0$$

$$0 \equiv 0$$

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

$$\frac{dy}{dx} + p(x) y = 0 \qquad y = C_1 e^{-\int p(x)\,dx}$$

$$y = C_1 e^{-a_1 x} \longrightarrow y e^{a_1 x} = C_1$$

$$\frac{dy}{dx} = C_1\left(-a_1 e^{-a_1 x}\right) \longrightarrow \frac{\frac{dy}{dx}}{-a_1} e^{a_1 x} = C_1$$

$$y e^{a_1 x} = -\frac{\frac{dy}{dx}}{a_1} e^{a_1 x}$$

$$y = -\frac{\frac{dy}{dx}}{a_1}$$

$$-a_1 y = \frac{dy}{dx}$$

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

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

$$y e^{\int p(x)\,dx} = C_1$$

$$y = C_1 e^{-b}$$

$$y = \frac{C_1}{e^{b}}$$

$$y e^{b} = C_1$$

$$F(x, y) = C_1$$

$$\frac{d}{dx} F(x, y) = 0$$

$$\frac{\partial F}{\partial x} + \frac{\partial F}{\partial y} \cdot \frac{dy}{dx} = 0$$

$$y e^{\int p(x)\,dx} = C_1 \quad \Big/ \frac{d}{dx}$$

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

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

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

Examen médico automatizado

27 febrero.

A. Barros Sierra. (Ed. A)

De 9 a 18:00 hrs.

$$\frac{dy}{dx} + 4y = 0 \qquad y_g = C_1 e^{-4x}$$

$$\frac{dy}{dx} - 8y = 0 \qquad y_g = C_1 e^{8x}$$

$$\frac{dy}{dx} - \frac{3}{4}y = 0 \qquad y_g = C_1 e^{\frac{3}{4}x}$$

$$\frac{dy}{dx} + \sqrt{2}\,y = 0 \qquad y_g = C_1 e^{-\sqrt{2}x}$$