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

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

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

$$\frac{dy}{dx} - \frac{1}{xLx}y = \frac{3x^3Lx - x^3}{xLx}$$

$$\frac{dy}{dx} - \frac{1}{xLx}y = 3x^2 - \frac{x^2}{Lx}$$

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

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

$$\int p(x)dx = \int\left(-\frac{1}{xLx}\right)dx \Rightarrow -\int \frac{\frac{dx}{x}}{Lx} \Rightarrow -\int \frac{du}{u} \Rightarrow -L(u)$$

$$u = Lx$$

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

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

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

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

$$q(x) = 3x^2 - \frac{x^2}{\ln x} \qquad e^{-\int p(x)dx} = \ln x$$

$$\int e^{\int p(x)dx} q(x)\,dx = \int \frac{1}{\ln x}\left(3x^2 - \frac{x^2}{\ln x}\right)dx$$

$$= 3\int \frac{x^2}{\ln x}dx - \int \left(\frac{x}{\ln x}\right)^2 dx$$

$$\int \frac{x^2\,dx}{\ln x} \qquad \int u\,dv = uv - \int v\,du$$

$$u = \frac{1}{\ln x} \qquad du = -\frac{1}{(\ln x)^2}\cdot\frac{dx}{x}$$

$$dv = x^2\,dx \qquad v = \frac{x^3}{3}$$

$$\int \frac{x^2\,dx}{\ln x} = \frac{x^3}{3\ln x} - \int -\left(\frac{dx}{(\ln x)^2\cdot x}\right)\frac{x^3}{3}$$

$$3\int \frac{x^2\,dx}{\ln x} = \frac{x^3}{\ln x} + \int \frac{x^2}{(\ln x)^2}dx$$

$$\int e^{\int p(x)dx} q(x)\,dx = \frac{x^3}{\ln x} + \cancel{\int \frac{x^2}{(\ln x)^2}dx} - \cancel{\int \frac{x^2\,dx}{(\ln x)^2}}$$

$$\int e^{\int p(x)dx} q(x)\,dx = \frac{x^3}{\ln x}$$

$$xLx\frac{dy}{dx}-y=3x^3Lx-x^3$$

$$y=C_1Lx+Lx\left(\frac{x^3}{Lx}\right)$$

$$\boxed{y=C_1Lx+x^3}$$

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

$$xLx\left(\frac{C_1}{x}+3x^2\right)-\left(C_1Lx+x^3\right)=3x^3Lx-x^3$$

$$\cancel{C_1Lx}+3x^3Lx-\cancel{C_1Lx}-x^3=3x^3Lx-x^3$$

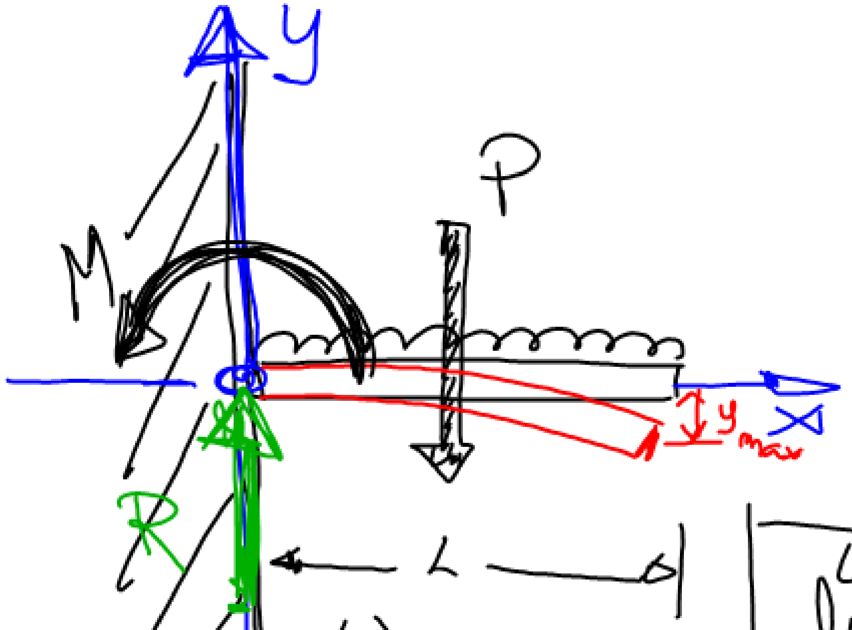
$$\cancel{3x^3Lx}-\cancel{x^3}-\cancel{3x^3Lx}+\cancel{x^3}=0$$

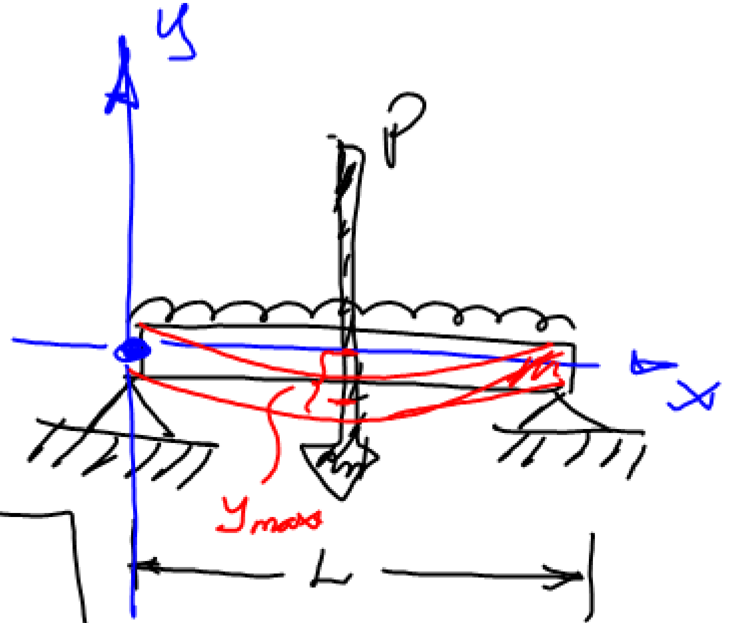
$$0\equiv 0$$

Problemas ED

con Condiciones Iniciales

Con Condiciones de frontera.





$$\boxed{\frac{d^4y}{dx^4}=0}$$

$y(0)=0$

$y'(0)=0$

$y''(0)=R \Rightarrow -P$

$y'''(0)=-M \Rightarrow \frac{P}{2}L$

Cond. INICIALES.

$y(0)=0 \qquad y(L)=0$

$y''(0)=\frac{-P}{2} \qquad y''(L)=\frac{-P}{2}$

Cond. de FRONTERA.

EDO(1) L cc H.

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

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

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

$$Ly + k_1 = x + k_2$$

$$Ly = x + (k_2 - k_1)$$

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

$$\boxed{y = C_1 e^{x}}$$

$y = \cos(x)$ $\qquad \frac{dy}{dx} = -\operatorname{sen}(x)$

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

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

ES LA BASE

LINEALES

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

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

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

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

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

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

$$a_1 = -1$$

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

(H)

$$\left.\begin{aligned} y &= e^{mx} \\ \frac{dy}{dx} &= m e^{mx} \\ \frac{d^2y}{dx^2} &= m^2 e^{mx} \end{aligned}\right\} \quad \begin{aligned} &(m^2 e^{mx}) + a_1(m e^{mx}) + a_2(e^{mx}) = 0 \\ &(m^2 + a_1 m + a_2)\, e^{mx} = 0 \end{aligned}$$

$$e^{mx} = 0 \qquad mx \to -\infty$$

$y=0 \quad y'=0 \quad y''=0$ = TRIVIAL = inútil.

$$m^2 + a_1 m + a_2 = 0 \qquad \begin{matrix} m_1 \\ m_2 \end{matrix} \qquad m_1 \neq m_2 \in \mathbb{R}$$

$$\begin{matrix} e^{m_1 x} \\ e^{m_2 x} \end{matrix} \qquad W = \begin{vmatrix} e^{m_1 x} & e^{m_2 x} \\ m_1 e^{m_1 x} & m_2 e^{m_2 x} \end{vmatrix} \neq 0 \qquad \begin{aligned} &m_2 e^{m_2 x} e^{m_1 x} - m_1 e^{m_2 x} e^{m_1 x} = 0 \\ &(m_2 - m_1) \neq 0 \end{aligned}$$

$$\boxed{y_g = C_1 e^{m_1 x} + C_2 e^{m_2 x}}$$

EDO(n)LccH $\longrightarrow$ Ec CARACTERÍSTICA

EDO(n)L CVH $\longrightarrow$ NUNCA

i

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 8y = 0 \quad \text{EDO(2)L CC H.}$$

$$m^2 - 6m + 8 = 0$$

$$(m-4)(m-2) = 0 \qquad m_1 = 2$$

$$m_2 = 4$$

e^{2x}

e^{4x}

$$\boxed{y_g = c_1 e^{2x} + c_2 e^{4x}}$$