Clasificar:

$$\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + \log(x)\, y = 3\cos(4x)$$

EDO(2) L cv NH.

$$\frac{\partial^2 y}{\partial t^2} + \frac{\partial y}{\partial x} = y$$

EDenDP(2)

$$\left(\frac{dx}{dt}\right)^2 = 5\cos(2t)\cdot x$$

EDO(1) NL

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

EDO(3) L cc NH

$$\frac{d^4z}{dt^4} - 2\frac{d^2z}{dt^2} + 2z = 0$$

EDO(4) L cc H

Cap II: Lineal

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

trivial

$$y = c_1 e^{-\int p(x)dx} \qquad \boxed{y=0 \quad \frac{dy}{dx}=0}$$

$$y = \frac{c_1}{e^{\int p\,dx}} \rightarrow e^{\int p\,dx} \cdot y = c_1$$

$$F(x,y) = c_1 \qquad \frac{d}{dx}F(x,y) = 0$$

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

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

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

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

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

$$e^{\int p\,dx} \neq 0$$

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

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

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

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

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

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

$$\begin{tikzcd}
\text{EDO} \arrow[r, bend left, "\text{Vs.}"] \arrow[r, bend right, "F_{I_1}"'] & y_g \arrow[l, "\text{Fact}"']
\end{tikzcd}$$

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

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

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

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

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

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

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

$$\boxed{\underbrace{y}_{g/nh} = \underbrace{C_1 e^{-\int p(x)dx}}_{y_{g/h}} + \underbrace{e^{-\int p(x)dx}\int e^{\int p(x)dx} q(t)dx}_{+\,y_p}}$$

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

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

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

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

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

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

$$\frac{\frac{a}{b}}{\frac{c}{d}} \Rightarrow \frac{ad}{bc}$$

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

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

$$\frac{1}{x L x}$$

$$= -\int \frac{\frac{dx}{x}}{L x} \Rightarrow$$

$$\frac{\frac{1}{x}}{L x}$$

$$= -L(L x)$$

$$= L(L x^{-1})$$

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

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