FACTOR INTEGRANTE

$$x^3y^2 + x^4y - 6x^5y^3 = C_1 \quad SG$$

$$\underbrace{\left(3x^2y^2 + 4x^3y - 30x^4y^3\right)}_{M} + \underbrace{\left(2x^3y + x^4 - 18x^5y^2\right)}_{N}\frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = 6x^2y + 4x^3 - 90x^4y^2$$

$$\frac{\partial N}{\partial x} = 6x^2y + 4x^3 - 90x^4y^2$$

EXACTA.

$$x^2\left(3y^2 + 4xy - 30x^2y^3\right) + x^2\left(2xy + x^2 - 18x^3y^2\right)\frac{dy}{dx} = 0$$

$$\Rightarrow \underbrace{\left(3y^2 + 4xy - 30x^2y^3\right)}_{MM} + \underbrace{\left(2xy + x^2 - 18x^3y^2\right)}_{NN}\frac{dy}{dx} = 0$$

$$\frac{\partial MM}{\partial y} = 6y + 4x - 90x^2y^2$$

$$\frac{\partial NN}{\partial x} = 2y + 2x - 54x^2y^2$$

$$\frac{\partial MM}{\partial y} \neq \frac{\partial NN}{\partial x}$$ NO-EXACTA.

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

$$\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x} \quad \text{NO EXACTA.}$$

Matematicamente: Para toda EDO(1)NL NO-EXACTA debe existir un "factor integrante" que la convierta en EXACTA.

$\mu(x,y)$ será el factor integrante.

$$\mu(x,y)M(x,y) + \mu(x,y)N(x,y)\frac{dy}{dx} = 0$$

$$\frac{\partial}{\partial y}\mu M = \frac{\partial}{\partial x}\mu N$$

$$\mu(x,y)\frac{\partial M(x,y)}{\partial y} + M(x,y)\frac{\partial \mu(x,y)}{\partial y} = \mu(x,y)\frac{\partial N}{\partial x} + N(x,y)\frac{\partial \mu}{\partial x}$$

EDenDP (1) L.

si $\mu \Rightarrow \mu(x)$

$$\mu(x)\frac{\partial M}{\partial y} = \mu(x)\frac{\partial N}{\partial x} + N\cdot\frac{d\mu}{dx}$$

EDO(1) NL $\longrightarrow$ Variables Separables

$$\mu(x)\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right) = N\frac{d\mu}{dx}$$

$$\frac{d\mu}{\mu} = \left(\underbrace{\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}}_{g(x)}\right)dx$$

$$\underbrace{(3y^2+4xy-30x^2y^3)}_{M}+\underbrace{(2xy+x^2-18x^3y^2)}_{N}\frac{dy}{dx}=0$$

$$\frac{\partial M}{\partial y}=6y+4x-90x^2y^2 \qquad \frac{\partial N}{\partial x}=2y+2x-54x^2y^2$$

$\mu(x)$

$$\frac{d\mu}{\mu}=\left(\frac{6y+4x-90x^2y^2-2y-2x+54x^2y^2}{2xy+x^2-18x^3y^2}\right)dx$$

$$=\left(\frac{4y+2x-36x^2y^2}{2xy+x^2-18x^3y^2}\right)dx$$

$$=\frac{2\cancel{(2y+x-18x^2y^2)}}{x\cancel{(2y+x-18x^2y^2)}}\,dx$$

$$\frac{d\mu}{\mu}=\frac{2}{x}\,dx \leftarrow \text{VS}$$

$$\int\frac{d\mu}{\mu}=2\int\frac{dx}{x} \Rightarrow L\mu=2Lx+C_1$$

$$L\mu=Lx^2+C_1$$

$$\frac{L\mu}{Lx^2}=C_1$$

$$\frac{\mu}{x^2}=e^{C_1}$$

$$\boxed{\mu=C_{10}x^2}$$

$$\boxed{\mu(x)=x^2}$$

$$\mu \frac{\partial M}{\partial y} + M \frac{\partial \mu}{\partial y} = \mu \frac{\partial N}{\partial x} + N \frac{\partial \mu}{\partial x}$$

$$\mu \Rightarrow \mu(y)$$

$$\mu \frac{\partial M}{\partial y} + M \frac{d\mu}{dy} = \mu \frac{\partial N}{\partial x}$$

$$M \frac{d\mu}{dy} = \mu \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right)$$

$$\frac{d\mu}{\mu} = \underbrace{\left(\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M} \right)}_{H(y)} dy \qquad \text{VS}$$