EDO(1)NL

- VARIABLES SEPARABLES.
- EXACTAS.

$F(x,y) = C_1$ SOLUCIÓN GENERAL

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

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

$$\left.\begin{array}{l} \dfrac{\partial M}{\partial y} = \dfrac{\partial N}{\partial x} \\ \dfrac{\partial^2 F}{\partial y \partial x} = \dfrac{\partial^2 F}{\partial x \partial y} \end{array}\right\} \text{EXACTA.}$$

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

$$\left(3x^2y^2 + 2xy^3 + 8xy\right) +$$

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

$$x\left(3xy^2 + 2y^3 + 8y\right) + x\left(2x^2y + 3xy^2 + 4x\right)\frac{dy}{dx} = 0$$

$$\left(3xy^2 + 2y^3 + 8y\right) + \left(2x^2y + 3xy^2 + 4x\right)\frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = 6xy + 6y^2 + 8$$

$$\frac{\partial N}{\partial x} = 4xy + 3y^2 + 4$$

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

$$\frac{d\mu}{\mu} = \left(\frac{6xy + 6y^2 + 8 - 4xy - 3y^2 - 4}{2x^2y + 3xy^2 + 4x}\right)dx$$

$$\frac{d\mu}{\mu} = \frac{2xy + 3y^2 + 4}{2x^2y + 3xy^2 + 4x}\,dx$$

$$\frac{d\mu}{\mu} = \frac{\cancel{2xy + 3y^2 + 4}}{x\cancel{(2xy + 3y^2 + 4)}}\,dx$$

$$\frac{d\mu}{\mu} = \frac{dx}{x}$$

$$L\mu = Lx + Lc$$

$$L\mu = Lcx$$

$$\boxed{\mu = cx}$$

$$M + N\frac{dy}{dx} = 0 \quad \text{NO EXACTA.}$$

$\mu \Rightarrow$ FACTOR INTEGRANTE.

$$\mu M + \mu N\frac{dy}{dx} = 0 \quad \text{EXACTA}$$

$$\mu M + \mu N\frac{dy}{dx} = 0$$

$$\frac{\partial \mu M}{\partial y} = \frac{\partial \mu N}{\partial x} \quad \text{EXACTA.}$$

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

EDenDP capítulo V

$$M + N\frac{dy}{dx} = 0 \quad \text{NO EXACTA.}$$

$$\mu M + \mu N\frac{dy}{dx} = 0 \quad \text{EXACTA.}$$

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

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

$$\mu(x)\frac{\partial M}{\partial y} = \mu\frac{\partial N}{\partial x} + N\frac{d\mu}{dx} \quad \text{EDO(1)NL}$$

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

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

$$\frac{1}{\mu}\frac{d\mu}{dx} = \left(\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}\right)$$

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

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

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

$$M(x,y) = p(x)y \qquad N(x,y) = 1$$

$$\frac{\partial M}{\partial y} = p(x) \qquad \frac{\partial N}{\partial x} = 0$$

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

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

$$\frac{d\mu}{\mu} = \left(\frac{p(x) - 0}{1} \right) dx$$

$$\int \frac{d\mu}{\mu} = \int p(x)\,dx$$

$$\ln \mu = \int p(x)\,dx$$

$$\boxed{\mu = e^{\int p(x)dx}}$$

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

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

$$\frac{\partial MM}{\partial y} = p(x)e^{\int p(x)dx} \qquad \frac{\partial NN}{\partial x} = e^{\int p(x)dx} p(x)$$

EXACTA

$$SG \Rightarrow \int MM\,dx + \int \left(NN - \frac{\partial}{\partial y} \int MM\,dx \right) dy = C_1$$

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

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

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

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

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

Método Factor Integrante

Si $\mu(x)$

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

Si $\mu(y)$

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

$\mu(x,y)$

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

EDenDP.