EDO (1) NL

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

SERÁ EXACTA.

$$x^2 + 5xy^3 + 6x^2y^2 - 8x^3y + y^2 = C \qquad SG$$

$F(x,y) = C$ no lineal en y

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

$$2x + 5y^3 + 12xy^2 - 24x^2y + (0) + \Big((0) + 15xy^2 + 12x^2y -$$
$$-8x^3 + 2y\Big)\cdot\frac{dy}{dx} = 0$$

$$M(x,y) = 2x + 5y^3 + 12xy^2 - 24x^2y \Rightarrow \frac{\partial F(x,y)}{\partial x}$$
$$N(x,y) = 15xy^2 + 12x^2y - 8x^3 + 2y \Rightarrow \frac{\partial F(x,y)}{\partial y}$$

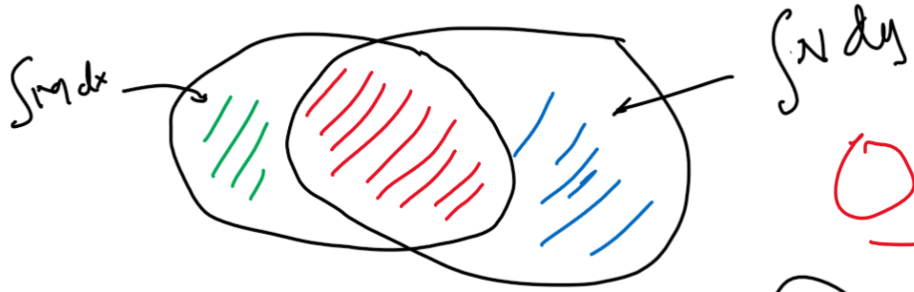
$$\frac{\partial^2 F(x,y)}{\partial x \partial y} = \frac{\partial M}{\partial y} \Rightarrow (0) + 15y^2 + 24xy - 24x^2$$

$$\frac{\partial^2 F(x,y)}{\partial y \partial x} = \frac{\partial N}{\partial x} \Rightarrow 15y^2 + 24xy - 24x^2$$

$=$

$$\boxed{\frac{\partial^2 F}{\partial x \partial y} = \frac{\partial^2 F}{\partial y \partial x}}$$

ES EXACTA.



$\rightarrow$ $M\,dx \quad N\,dy = C$ SG

$$\int M\,dx = \int (2x + 5y^3 + 12xy^2 - 24x^2y)\,dx$$
$$= 2\int x\,dx + 5y^3\int dx + 12y^2\int x\,dx - 24y\int x^2\,dx$$
$$= x^2 + \underline{5xy^3 + 6x^2y^2 - 8x^3y}$$
$$\int N\,dy = \int (15xy^2 + 12x^2y - 8x^3 + 2y)\,dy$$
$$= 15x\int y^2\,dy + 12x^2\int y\,dy - 8x^3\int dy + 2\int y\,dy$$
$$= \underline{5xy^3 + 6x^2y^2 - 8x^3y} + y^2$$

$$\boxed{x^2 + 5xy^3 + 6x^2y^2 - 8x^3y + y^2 = C}$$

$$\boxed{x^2 + 5xy^3 + 6x^2y^2 - 8x^3y + y^2 = C}$$

$$SG \Rightarrow \int M\,dx + \int \underline{\left(N - \frac{\partial}{\partial y}\int M\,dx\right)}\,dy = C$$
$$SG1 \Rightarrow \int N\,dy + \int \underline{\left(M - \frac{\partial}{\partial x}\int N\,dy\right)\,dx} = C$$

$$M(x,y) + N(x,y)\frac{dy}{dx} = 0 \quad \text{EDO(1)NL}$$

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

Existen siempre unas funciones conocidas como "FACTOR INTEGRANTE" que multiplicado por la ecuación la vuelve EXACTA.

FACTOR INTEGRANTE

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

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

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

Capítulo 4

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

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

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

$$\boxed{\frac{d\mu}{\mu} = \left[\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}\right]dx}$$

$f(x)$

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

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

$$\ln \mu = \int f(x)\,dx + C$$

$$\mu = e^{\int f(x)\,dx + C}$$

$$\mu = e^{C} e^{\int f(x)\,dx}$$

$$\mu(x) = C_1 e^{\int f(x)\,dx}$$

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

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

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

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

$g(y)$

$$\int \frac{d\mu}{\mu} = \int g(y)\,dy$$

FACTOR INTEGRANTE. $\mu(y) = C_1 e^{\int g(y)\,dy}$

EDO (1) NL ←