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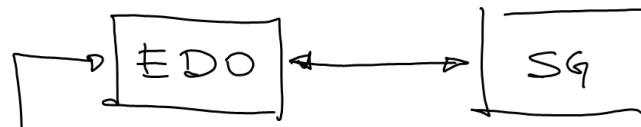
## "LAS CIENCIAS BÁSICAS EN LA CUARTA REVOLUCIÓN TECNOLÓGICA"

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**PRESIDENTE DE LA ACADEMIA DE INGENIERÍA**

**19 de febrero de 2019, 13:00 HORAS**  
**AUDITORIO SOTERO PRIETO**

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## + ECUACIÓN DIFERENCIAL EXACTA



$$F(x, y) = C.$$

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

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

$$\begin{cases} M(x, y) = \frac{\partial F(x, y)}{\partial x} \\ N(x, y) = \frac{\partial F(x, y)}{\partial y} \end{cases}$$

$$\frac{\partial^2 F(x, y)}{\partial x \partial y} = \frac{\partial^2 F(x, y)}{\partial y \partial x}$$

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

$$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} \quad \text{EDO se DENOMINA EXACTA}$$

$$SG \Rightarrow \boxed{xy^2 + 4x^2y^3 + 5xy^4 - 3y^5 = C}$$

$$\boxed{F(x, y) = C} \quad \text{EDO(1)NL} \quad \frac{\partial}{\partial x} F(x, y) = 0$$

$$\underbrace{(3x^2y^2 + 8xy^3 + 5y^4)}_{M(x, y)} + \underbrace{(2x^3y + 12x^2y^2 + 20xy^3 - 15y^4)}_{N(x, y)} \frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = 6x^2y + 24xy^2 + 20y^3$$

$$\frac{\partial N}{\partial x} = 6x^2y + 24xy^2 + 20y^3$$

$$\frac{\partial M}{\partial y} \equiv \frac{\partial N}{\partial x} \quad \therefore \text{EDO(1)NL EXACTA.}$$

$$\int M dx = y^2 \int x^2 dx + 8y^3 \int x dx + 5y^4 \int dx$$

$$= y^2 x^3 + 4y^3 x^2 + 5y^4 x$$

$$\int N dy = 2x^3 \int y dy + 12x^2 \int y^2 dy + 20x \int y^3 dy - 15 \int y^4 dy$$

$$= x^3 y^2 + 4x^2 y^3 + 5x y^4 - 3y^5$$

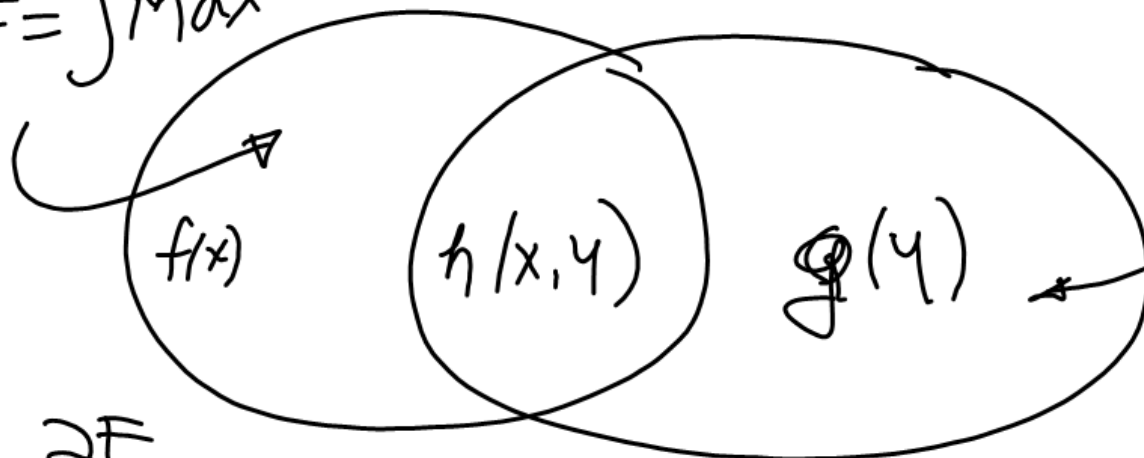
$$\boxed{xy^2 + 4x^2y^3 + 5xy^4 - 3y^5} = C$$

$$F(x, y) = C$$

PERO

$$F = \int M dx$$

$$\int N dy$$



$$M = \frac{\partial F}{\partial x}$$

$$N = \frac{\partial F}{\partial y}$$

$$F(x, y) = \left[ \int M dx \right] \cup \left[ \int N dy \right]$$

$$F(x, y) = \int M dx + \int N dy - \left[ \int M dx \cap \int N dy \right]$$

$$\overset{M}{(x^3 + xy^2)} + \overset{N}{(x^2y + y^3)} \frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} \quad \begin{matrix} \text{o.o.F.D.O} \\ \text{Exacta} \end{matrix}$$

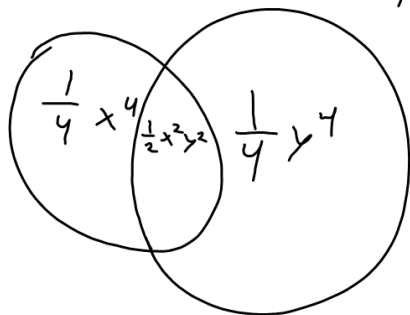
$$\frac{\partial M}{\partial y} = 2yx \quad \frac{\partial N}{\partial x} = 2xy$$

$$\int M dx = \int x^3 dx + y^2 \int x dx$$

$$\int M dx = \frac{1}{4} x^4 + \frac{y^2}{2} x^2$$

$$\int N dy = x^2 \int y dy + \int y^3 dy$$

$$\int N dy = \frac{x^2}{2} y^2 + \frac{1}{4} y^4$$

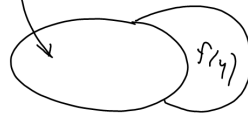


$$\frac{1}{4} x^4 + \frac{1}{2} x^2 y^2 + \frac{1}{4} y^4 = C \in SG$$

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

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

$$\int M dx + \int \left( N - \frac{\partial}{\partial y}(M dx) \right) dy = C.$$



$$\int N dy + \int \left( M - \frac{\partial}{\partial x}(N dy) \right) dx = C$$

$$\int M dx = \frac{x^4}{4} + \frac{x^2 y^2}{2} \quad N(x, y) = x^2 y + y^3$$

$$\frac{\partial}{\partial y} \int M dx = x^2 y$$

$$S_1 \Rightarrow \left( \frac{x^4}{4} + \frac{x^2 y^2}{2} \right) + \int (\cancel{x^2 y + y^3} - \cancel{x^2 y}) dy = C$$

$$\frac{x^4}{4} + \frac{x^2 y^2}{2} + \int y^3 dy = C$$

$$\boxed{\frac{x^4}{4} + \frac{x^2 y^2}{2} + \frac{y^4}{4} = C} \quad S_1.$$

$$\int N dy = \frac{x^2 y^2}{2} + \frac{y^4}{4}$$

$$\frac{\partial}{\partial x} \int N dy = x y^2$$

$$M(x, y) = x^3 + x y^2$$

$$S_2 \Rightarrow \frac{x^2 y^2}{2} + \frac{y^4}{4} + \int (\cancel{x^3 + x y^2} - \cancel{x y^2}) dx = C$$

$$\Rightarrow \frac{x^2 y^2}{2} + \frac{y^4}{4} + \int x^3 dx = C$$

$$S_2 \Rightarrow \boxed{\frac{x^2 y^2}{2} + \frac{y^4}{4} + \frac{x^4}{4} = C}.$$