

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

$$\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$$

$$(SG) \quad x^3 y^2 + 8 y^3 x^2 + 16 x^2 y^2 = C_1$$

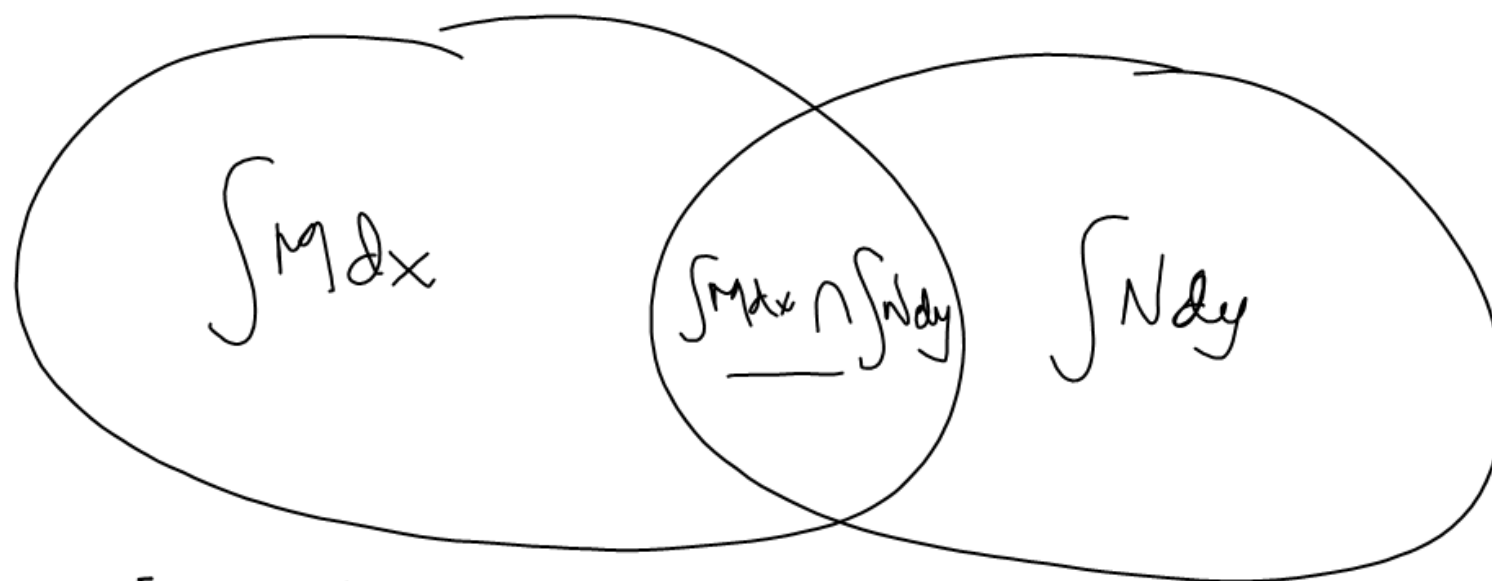
$$(EDO) \quad \frac{d}{dx} (x^3 y^2 + 8 y^3 x^2 + 16 x^2 y^2) = 0$$

$$\underbrace{(3x^2 y^2 + 16x y^3 + 32x y^2)}_M + \underbrace{(2x^3 y + 24x^2 y^2 + 32x^2 y)}_N \frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = 6x^2 y + 48x y^2 + 64x y$$

$$\frac{\partial N}{\partial x} = 6x^2 y + 48x y^2 + 64x y$$

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



$$[\int M dx] \cup [\int N dy] - [\int M dx] \cap [\int N dy] = C$$

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

$$M = 3x^2y^2 + 16xy^3 + 32x^2y$$

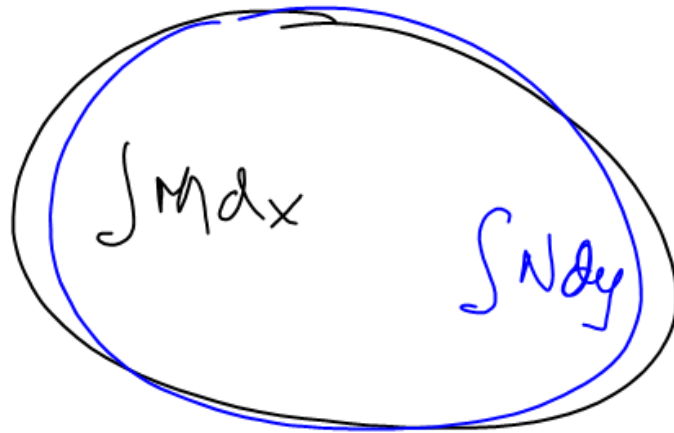
$$\begin{aligned} \int M dx &= 3y^2 \int x^2 dx + 16y^3 \int x dx + 32y^2 \int x dx \\ &= 3y^2 \cdot \frac{x^3}{3} + 16y^3 \cdot \frac{x^2}{2} + 32y^2 \cdot \frac{x^2}{2} \\ \int M dx &= y^2 x^3 + 8y^3 x^2 + 16y^2 x^2 \end{aligned}$$

$$\frac{\partial}{\partial y} \int M dx = 2x^3y + 24x^2y^2 + 32x^2y$$

$$\begin{aligned} \left(N - \frac{\partial}{\partial y} \int M dx \right) &= (\cancel{2x^3y} + \cancel{24x^2y^2} + \cancel{32x^2y}) - \\ &\quad (\cancel{2x^3y} + \cancel{24x^2y^2} + \cancel{32x^2y}) = \\ &= 0 \end{aligned}$$

(SG)

$$\begin{aligned} \int M dx + \int \left(N - \frac{\partial}{\partial y} \int M dx \right) dy &= C \\ x^3y^2 + 8x^2y^3 + 16x^2y^2 &= C \end{aligned}$$



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

$$\underbrace{\left(\frac{x}{\sqrt{x^2+y^2}} + \frac{1}{x} + \frac{1}{y} \right)}_M + \underbrace{\left(\frac{y}{\sqrt{x^2+y^2}} + \frac{1}{y} - \frac{x}{y^2} \right)}_N \frac{dy}{dx} = 0$$

$$M = (x^2 + y^2)^{-\frac{1}{2}} x + x^{-1} + y^{-1}$$

$$\frac{\partial M}{\partial y} = -\frac{1}{2} (x^2 + y^2)^{-\frac{3}{2}} \cdot 2y \cdot x + (0) - y^{-2}$$

$$N = (x^2 + y^2)^{-\frac{1}{2}} y + y^{-1} - x y^{-2}$$

$$\frac{\partial N}{\partial x} = -\frac{1}{2} (x^2 + y^2)^{-\frac{3}{2}} \cdot 2x \cdot y + (0) - y^{-2}$$

$\therefore$ EXACTA

$$\int M dx = \sqrt{x^2 + y^2} + L(x) + \frac{x}{y}$$

$$\frac{\partial}{\partial y} \int M dx = \frac{1}{2} (x^2 + y^2)^{-\frac{1}{2}} 2y + (0) - \frac{x}{y^2}$$

$$N = (x^2 + y^2)^{-\frac{1}{2}} y + y^{-1}$$

$$N - \frac{\partial}{\partial y} \int M dx = (0) + y^{-1} + (0)$$

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

$$\boxed{\sqrt{x^2 + y^2} + L(x) + \frac{x}{y} + L(y) = C,}$$

Equación

$$(3x^2y^2 + 16xy^3 + 32x^2y) + (2x^3y + 24x^2y^2 + 32x^2y) \frac{dy}{dx} = 0$$

$$x(3xy^2 + 16y^3 + 32y^2) + x(2x^2y + 24xy^2 + 32xy) \frac{dy}{dx} = 0$$

$$\rightarrow (3xy^2 + 16y^3 + 32y^2) + (2x^2y + 24xy^2 + 32xy) \frac{dy}{dx} = 0$$

$$M + N \frac{dy}{dx} = 0 \quad \text{No ES EXACTA}$$

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

$$\frac{\partial}{\partial y} MM = \frac{\partial}{\partial x} NN$$

$$\mu \frac{\partial MM}{\partial y} + MM \cdot \frac{\partial \mu}{\partial y} = \mu \frac{\partial NN}{\partial x} + NN \frac{\partial \mu}{\partial x}$$

$$\mu(x) \frac{\partial MM}{\partial y} + (0) = \mu(x) \frac{\partial NN}{\partial x} + NN \frac{d\mu(x)}{dx}$$

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

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