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

Exacta.

$$x^4y^3 + x^2y^2 - 6xy^3 + 8y^2 = C \qquad SG$$

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

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

$$\underbrace{\left(4x^3y^3 + 2xy^2 - 6y^3 + (0)\right)}_{M(x,y)} +$$

EDO(1)NL

$$\underbrace{\left(3x^4y^2 + 2x^2y - 18xy^2 + 16y\right)}_{N(x,y)}\frac{dy}{dx} = 0$$

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

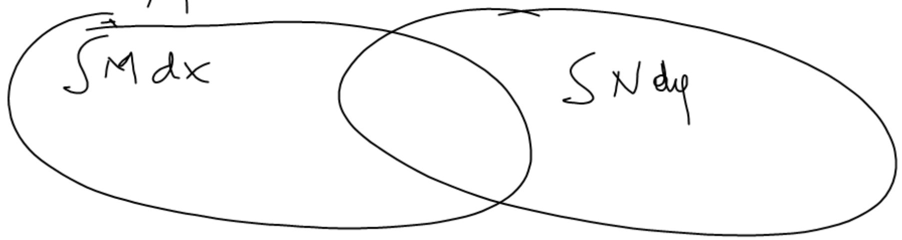
$$\frac{\partial M}{\partial y} = 12x^3y^2 + 4xy - 18y^2$$

$=$

$$\frac{\partial N}{\partial x} = 12x^3y^2 + 4xy - 18y^2 + (0)$$

EXACTA.

$$\underbrace{(4x^3y^3 + 2xy^2 - 6y^3)}_{M} + \underbrace{(3x^4y^2 + 2x^2y - 18xy^2 + 16y)}_{N}\frac{dy}{dx} = 0$$



$$\int M\,dx + \int N\,dy - \int M\,dx \cap \int N\,dy = 0$$

$$SG\ 1 \rightarrow \int M\,dx + \int\left[N - \frac{\partial}{\partial y}\int M\,dx\right]dy = 0$$

$$SG\ 2 \rightarrow \int N\,dy + \int\left[M - \frac{\partial}{\partial x}\int N\,dy\right].\,dx = 0$$

$$\int M\,dx \Rightarrow \int(4x^3y^3 + 2xy^2 - 6y^3)\,dx$$

$$4y^3\int x^3dx + 2y^2\int x\,dx - 6y^3\int dx$$

$$4y^3\left(\frac{x^4}{4}\right) + 2y^2\left(\frac{x^2}{2}\right) - 6y^3x$$

$$\int M\,dx = y^3x^4 + y^2x^2 - 6y^3x$$

$$\frac{\partial\int M\,dx}{\partial y} = 3y^2x^4 + 2yx^2 - 18y^2x$$

$$N - \frac{\partial}{\partial y}\int M\,dx = (\cancel{3x^4y^2} + \cancel{2x^2y} - \cancel{18xy^2} + 16y) - (\cancel{3x^4y^2} + \cancel{2yx^2} - \cancel{18y^2x}) = 16y$$

$$\int\left(N - \frac{\partial}{\partial y}\int M\,dx\right)dx = 16\int y\,dy$$

$$= 8y^2$$

$$SG \Rightarrow \boxed{x^4y^3 + x^2y^2 - 6y^3x + 8y^2 = C}$$

$$SG \Rightarrow x^4y^3 + x^2y^2 - 6xy^3 + 8y^2 = c_1$$

$$(4x^3y^3 + 2xy^2 - 6y^3) + (3x^4y^2 + 2x^2y - 18xy^2 + 16y)\frac{dy}{dx} = 0$$

$$y(4x^3y^2 + 2xy - 6y^2) + y(3x^4y + 2x^2 - 18xy + 16)\frac{dy}{dx} = 0$$

$$(4x^3y^2 + 2xy - 6y^2) + (3x^4y + 2x^2 - 18xy + 16)\frac{dy}{dx} = 0$$

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

Factor Integrante $= \mu(x,y)$

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

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

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

$\mu(y)$

$$\mu(y)\frac{\partial M}{\partial y} + M\frac{d\mu}{dy} = \mu(y)\frac{\partial N}{\partial x} + N\cdot(0)$$

$$(4x^3y^2 + 2xy - 6y^2) + (3x^4y + 2x^2 - 18xy + 16)\frac{dy}{dx} = 0$$

M

$$\frac{\partial M}{\partial y} = 8x^3y + 2x - 12y$$

$$\frac{\partial N}{\partial x} = 12x^3y + 4x - 18y$$

$$\mu(y)\cdot(8x^3y + 2x - 12y) + (4x^3y^2 + 2xy - 6y^2)\frac{d\mu(y)}{dy} =$$

$$\mu(y)\cdot(12x^3y + 4x - 18y)$$

$$(4x^3y^2 + 2xy - 6y^2)\frac{d\mu}{dy} = \mu(y)(12x^3y + 4x - 18y - 8x^3y - 2x + 12y)$$

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

$$= \mu\frac{\cancel{(4x^3y + 2x - 6y)}}{y\cancel{(4x^3y + 2x - 6y)}}$$

$$\frac{d\mu}{dy} = \frac{\mu}{y}$$

$$\int\frac{d\mu}{\mu} = \int\frac{dy}{y}$$

$$\ln\mu = \ln y$$

$$\mu(y) = y$$