FACTOR INTEGRANTE.

1.- SIEMPRE HAY F.I.

2.- TODA EDO(1)NL - NO-EXACTA
TIENE F.I $\neq 1$.

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

$$\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$$

$M(x,y) \quad N(x,y) \quad \frac{\partial M}{\partial y} \quad \frac{\partial N}{\partial x}$

$\mu(x,y)$ factor integrante

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

EXACTA

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

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

$\mu(x,y)$ incógnita

ECUACIÓN EN DERIVADAS PARCIALES

MUY DIFÍCIL RESOLVER.

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

H.: $$= \mu(x,y)\frac{\partial N(x,y)}{\partial x} + N(x,y)\frac{\partial \mu(x,y)}{\partial x}$$

$$\mu(x,y) \Rightarrow \mu(x).$$

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

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

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

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

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

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

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

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

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

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

$$\mu(y) = e^{\int G(y)dy}$$

234. $(1 - x^2y)\,dx + x^2(y - x)\,dy = 0, \quad \mu = \varphi(x).$

$$M(x,y) = 1 - x^2y$$

$$N(x,y) = x^2y - x^3$$

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

$$\frac{\partial N}{\partial x} = 2xy - 3x^2 \qquad \frac{\partial M}{\partial x} \neq \frac{\partial N}{\partial x} \quad \text{NO EXACTA}$$

$$\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N} = \frac{(-x^2) - (2xy - 3x^2)}{x^2y - x^3}$$

$$= \frac{-x^2 - 2xy + 3x^2}{x^2y - x^3}$$

$$= \frac{-2xy + 2x^2}{x^2y - x^3}$$

$$= \frac{-2(xy - x^2)}{x(xy - x^2)} \Rightarrow -\frac{2}{x}$$

$$\frac{d\mu}{\mu} = \left(-\frac{2}{x}\right)dx$$

$$\int \frac{d\mu}{\mu} = -2\int \frac{dx}{x}$$

$$\ell\mu = -2\,\ell x$$

$$\ell\mu = \ell x^{-2}$$

$$\mu(x) = x^{-2}$$

234. $(1 - x^2 y)\,dx + x^2 (y - x)\,dy = 0,$

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

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

MM NN

$$\frac{\partial MM}{\partial y} = -1 \qquad \frac{\partial NN}{\partial x} = -1$$

ES EXACTA.

242. $(2xy^2 - 3y^3)\,dx + (7 - 3xy^2)\,dy = 0.$

$$M = (2xy^2 - 3y^3) \qquad \frac{\partial M}{\partial y} = 4xy - 9y^2$$

N.E.

$$N = (7 - 3xy^2) \qquad \frac{\partial N}{\partial x} = (0) - 3y^2$$

$$F(x) = \left(\frac{(4xy - 9y^2) - (-3y^2)}{7 - 3xy^2}\right) \Rightarrow \frac{4xy - 6y^2}{7 - 3xy^2}$$

$$G(y) = \left(\frac{(-3y^2) - (4xy - 9y^2)}{2xy^2 - 3y^3}\right) \Rightarrow \frac{-4xy + 6y^2}{(2x - 3y)y^2} \Rightarrow \frac{-2\cancel{y}\cancel{(2x-3y)}}{\cancel{(2x-3y)}y^{\cancel{2}}}$$

$$G(y) = \frac{-2}{y} \qquad \frac{d\mu}{\mu} = -2\frac{dy}{y}$$

$$\int \frac{d\mu}{\mu} = -2\int \frac{dy}{y} \qquad L\mu = -2\,Ly$$

$$\boxed{\mu = \frac{1}{y^2}}$$

$$\frac{dy}{dx} + p(x)\,y = 0 \qquad \text{EDOL(1)CVH.}$$

$$\left(p(x)\,y\right) + (1)\frac{dy}{dx} = 0$$

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

$$N = 1 \qquad \frac{\partial N}{\partial x} = 0 \qquad \text{N.E.}$$

$$F(x) = \left(\frac{p(x) - (0)}{1}\right) \Rightarrow p(x)$$

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

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

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

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

$$e^{\int p(x)dx}\,p(x)\,y + e^{\int p(x)dx}\,\frac{dy}{dx} = 0$$

$$e^{\int p(x)dx}\,p(x)\,y\,dx + e^{\int p(x)dx}\,dy = 0$$

$$d\left(y\,e^{\int p(x)dx}\right) = 0$$

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

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