$$\underbrace{(x^2+y^2+1)}_{M} - \underbrace{2xy}_{N}\frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = (0) + 2y + (0)$$

$$\frac{\partial N}{\partial x} = -2y \qquad \text{NO EXACTA.}$$

$f(x)$

$$f\frac{\partial M}{\partial y} + \cancel{\frac{\partial f}{\partial y}}\,M = f\frac{\partial N}{\partial x} + N\cancel{\frac{\partial f}{\partial x}} \qquad \frac{df}{dx}$$

$$N\frac{df}{dx} = f\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$$

$$\longrightarrow \frac{df}{f} = \left(\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}\right)dx$$

$$= \left(\frac{2y-(-2y)}{-2xy}\right)dx$$

$$= \frac{4y}{-2xy} \Rightarrow \frac{-2}{x}$$

$$\int\frac{df}{f} = \int\frac{-2\,dx}{x} \Rightarrow -2\int\frac{dx}{x} \Rightarrow -2Lx$$

$$Lf = -2Lx$$

$$Lf = L\left(\frac{1}{x^2}\right)$$

$$f(x) = \frac{1}{x^2}$$

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

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

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

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

$$\frac{\partial MM}{\partial y} = \frac{2y}{x^2} \qquad \frac{\partial NN}{\partial x} = +\frac{2y}{x^2}$$

$$\int MM\,dx = \int dx + y^2\int\frac{dx}{x^2} + \int\frac{dx}{x^2}$$

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

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

$$SG = \left(x - \left(\frac{y^2+1}{x}\right)\right) + \int\left(\left(-\frac{2y}{x}\right) - \left(-\frac{2y}{x}\right)\right)dy = C_1$$

$$x - \frac{y^2}{x} - \frac{1}{x} = C_1$$

$$\boxed{x^2 - y^2 - 1 = C_1 x}$$

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

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

$$\frac{\partial M}{\partial y} = (0) - x \qquad \frac{\partial N}{\partial x} = (0) + 2x$$

NO ES EXACTA

$f(x) \Rightarrow$

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

$F(x, y)$

$$N\frac{df}{dx} = f\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$$

$$\frac{df}{f} = \left(\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}\right)dx$$

$$\frac{df}{f} = \left(\frac{-x - (2x)}{y + x^2}\right)dx$$

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

$f(x)$ NO ES FACTOR INTEGRANTE.

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

$$\frac{\partial M}{\partial y} = -x \qquad \frac{\partial N}{\partial x} = 2x$$

$g(y)$

$$g\frac{\partial M}{\partial y} + M\frac{dg}{dy} = g\frac{\partial N}{\partial x} + (0)$$

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

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

$$\frac{dg}{g} = \left(\frac{3x}{x - xy}\right)dy$$

$$\frac{dg}{g} = \left(\frac{3}{1-y}\right)dy$$

$$\int\frac{dg}{g} = -3\int\frac{dy}{(y-1)}$$

$$Lg = -3L(y-1)$$

$$Lg = L\left(\frac{1}{(y-1)^3}\right)$$

$$g = \frac{1}{(y-1)^3}$$

EDOL (1) cv NH.

$$\frac{dy}{dx} + p(x)\,y = q(x)$$

Regla de Oro. → LINEALES

$$y_{g/n-H} = y_{g/H_A} + y_{p/q(x)}$$

Homogénea asociada

$$\frac{dy}{dx} + p(x)y = 0$$

$$\frac{dy}{dx} = -p(x)y$$ Variables separables.

$$\int \frac{dy}{y} = -\int p(x)\,dx$$

$$\ln y = -\int p(x)\,dx + C_1$$

$$\ln y - C_1 = -\int p(x)\,dx$$

$$\ln y - \ln C = -\int p(x)\,dx$$

$$\ln\left(\frac{y}{C}\right) = -\int p(x)\,dx$$

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

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

SGHa.

$$\frac{dy}{dx} + p(x)y = 0$$

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

$$p(x)y + \frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = p(x) \qquad \frac{\partial N}{\partial x} = 0$$

$f(x)$

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

$$\frac{df}{dx} = f\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$$

$$\frac{df}{f} = \left(p(x) - (0)\right)dx$$

$$\int\frac{df}{f} = \int p(x)\,dx$$

$$\ln f = \int p(x)dx$$

FACTOR INTEGRANTE: $f(x) = e^{\int p(x)dx}$

$$\underbrace{e^{\int p(x)dx}}_{NN}\frac{dy}{dx} + \underbrace{\left[e^{\int p(x)dx}\right]p(x)\cdot y}_{MM} = 0$$

$$\frac{\partial MM}{\partial y} = e^{\int p(x)dx}\,p(x)$$

$$\frac{\partial NN}{\partial x} = e^{\int p(x)dx}\,p(x)$$

EXACTA.

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

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

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

$$\frac{dy}{dx} + p(x)\,y = q(x)$$

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

$$\frac{d}{dx}\left(e^{\int p(x)dx} \cdot y\right) = e^{\int p(x)dx} q(x)$$

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

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

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

$$\frac{dy}{dx} - \frac{y}{x} = x^2 \qquad p(x) = -\frac{1}{x}$$

$$q(x) = x^2$$

$$\int p(x)\,dx = -\int \frac{dx}{x} = -Lx$$

$$-\int p(x)\,dx = Lx$$

$$e^{\int p(x)\,dx} = e^{-Lx} \Rightarrow e^{L\frac{1}{x}} \Rightarrow \frac{1}{x}$$

$$e^{-\int p(x)\,dx} = e^{Lx} \Rightarrow x$$

$$y = c_1 x + x\int \frac{1}{x} x^2\,dx$$

$$y = c_1 x + x\left[\int x\,dx\right]$$

$$y = c_1 x + x\left(\frac{x^2}{2}\right)$$

$$\underline{y = c_1 x + \frac{x^3}{2}} \rightarrow \frac{dy}{dx} - \frac{y}{x} = x^2$$