EDO(1)NL. FACTOR INTEGRANTE.

$x^2y + x^3y^2 + x^4y^3 = C_1$ SG

$$\frac{\partial F}{\partial x} + \frac{\partial F}{\partial y}\cdot\frac{dy}{dx} = 0 \quad \text{EDO(1)NL.}$$

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

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

$$2x + 6x^2y + 12x^3y^2 = 2x + 6x^2y + 12x^3y^2$$

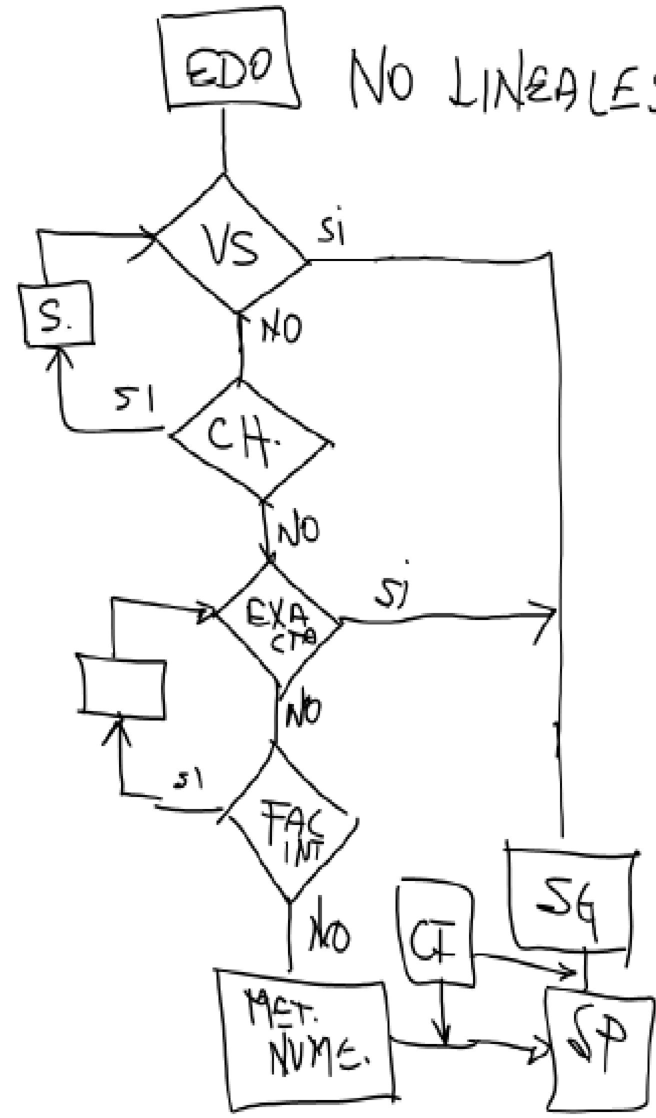
$$x\left(2y + 3xy^2 + 4x^2y^3\right) + x\left(x + 2x^2y + 3x^3y^2\right)\frac{dy}{dx} = 0$$

$$\underbrace{\left(2y + 3xy^2 + 4x^2y^3\right)}_{MM} + \underbrace{\left(x + 2x^2y + 3x^3y^2\right)}_{NN}\frac{dy}{dx} = 0$$

$$\frac{\partial MM}{\partial y} = 2 + 6xy + 12x^2y^2 \qquad \frac{\partial NN}{\partial x} = 1 + 4xy + 9x^2y^2$$

$$\frac{\partial MM}{\partial y} \neq \frac{\partial NN}{\partial x} \quad \text{NO EXACTA.}$$

NO LINEALES



Suponiendo EDO(1)NL - NO EXACTA.

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

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

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

EDO(1)NL $\rightarrow$ EXACTA.

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

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

$F(x,y) \Rightarrow f(x)$

$$\frac{\partial M}{\partial y} \cdot f = f' \cdot N + \frac{\partial N}{\partial x} \cdot f$$

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

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

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

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

$$\frac{df}{f} = \left(\frac{12x^2y^2+6xy+2-(9x^2y^2+4xy+1)}{3x^3y^2+2x^2y+x}\right) dx$$

$$= \left(\frac{3x^2y^2+2xy+1}{3x^3y^2+2x^2y+x}\right) dx$$

$$\frac{df}{f} = \left(\frac{\cancel{3x^2y^2+2xy+1}}{x(\cancel{3x^2y^2+2xy+1})}\right) dx$$

$$\frac{df}{f} = \frac{dx}{x}$$

$$\int \frac{df}{f} = \int \frac{dx}{x}$$

$$L f = L x$$

$$f = x$$

$$\frac{\partial F}{\partial y}\cdot M+\frac{\partial M}{\partial y}F=\cancel{\frac{\partial F}{\partial x}}\cdot N+\frac{\partial N}{\partial y}\cdot F$$

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

$$\frac{dg}{dy}\cdot M+\frac{\partial M}{\partial y}g=\frac{\partial N}{\partial x}\cdot g$$

$$\frac{dg}{dy}M=\frac{\partial N}{\partial x}\cdot g-\frac{\partial M}{\partial y}\cdot g$$

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

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

$$(2xy^2 - 3y^3) + (7 - 3xy^2)\frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = 4xy - 9y^2$$

$$\frac{\partial N}{\partial x} = -3y^2$$

$f(x) \Rightarrow$

$$\frac{df}{f} = \left(\frac{4xy - 9y^2 + 3y^2}{7 - 3xy^2}\right)dx$$

$$\frac{df}{f} = \left(\frac{4xy - 6y^2}{7 - 3xy^2}\right)dx$$

$g(y) \Rightarrow$

$$\frac{dg}{g} = \left(\frac{-3y^2 - 4xy + 9y^2}{2xy^2 - 3y^3}\right)dy$$

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

$$\left(\frac{2}{y}\cdot\left(\frac{3y^2 - 2xy}{-3y^2 + 2xy}\right)\right)dy$$

$$= \int -\frac{2}{y}\left(\frac{-3y^2 + 2xy}{-3y^2 + 2xy}\right)dy$$

$$\int \frac{dg}{g} = \int -\frac{2}{y}\,dy$$

$$\ln g = -2\ln y$$

$$\ln g = \ln(y^{-2})$$

$$g(y) = \frac{1}{y^2}$$

$$\frac{1}{y^2}(2xy^2 - 3y^3) + \frac{1}{y^2}(7 - 3xy^2)\frac{dy}{dx} = 0$$

$$\underbrace{(2x - 3y)}_{MM} + \underbrace{\left(\frac{7}{y^2} - 3x\right)}_{NN}\frac{dy}{dx} = 0$$

$$\frac{\partial MM}{\partial y} = -3 \qquad \frac{\partial NN}{\partial x} = -3$$

$$\int MM\,dx = 2\int x\,dx - 3y\int dx$$

$$= x^2 - 3xy$$

$$\int NN\,dy = 7\int \frac{dy}{y^2} - 3x\int dy$$

$$= 7\left(-\frac{1}{y}\right) - 3xy$$

$$= -\frac{7}{y} - 3xy$$

$$\boxed{-3xy + x^2 - \frac{7}{y} = C_1}$$

EDO(1) NL

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

EDO(1) LCV NH.

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

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

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

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

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

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

$$\frac{dy}{dx} - \frac{y}{x} = 0 \qquad p(x) = -\frac{1}{x}$$

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

$$= \ln x$$

$$y = c_1 e^{-\int p(x)\,dx}$$

$$= c_1 e^{\ln x}$$

$$y = c_1 x$$

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

$$-\int p(x)\,dx = -\int x^2\,dx$$

$$= -\left(\frac{x^3}{3}\right)$$

$$y = c_1 e^{-\frac{x^3}{3}}$$

$$\lambda y = \lambda c_1 - \frac{x^3}{3}$$

$$\boxed{\frac{x^3}{3} + \lambda y = c_2}$$

$$y = c_1 e^{-\int p(x)dx}$$

$$e^{\int p(x)dx} \cdot y = c_1 \qquad y = \frac{c_1}{e^{\int p(x)dx}}$$

$$\frac{d}{dx}\left(e^{\int p(x)dx} \cdot y\right) = c_1$$

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

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

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

$$F.I. = e^{\int p(x)dx}$$

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

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

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

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

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

$$y_{g/n-h} = y_{g/h} + y_{p/q}$$