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

$y(x)$ EDO(1) NL

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

Teorema de existencia y unicidad de la solución de un ecuación diferencial ordinaria no lineal.

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

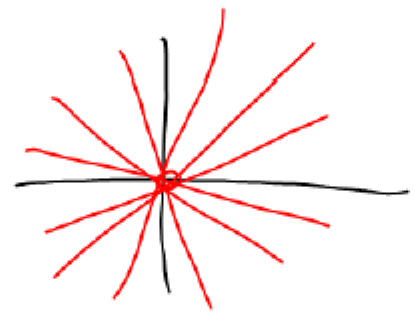
$$\frac{dy}{dx} = F(x,y)$$

a) $F(x,y)$ es lineal y continua

b) $\frac{\partial F}{\partial y}$ es lineal y continua

Su solución general sera lineal y única.

$$y_g = Cx$$



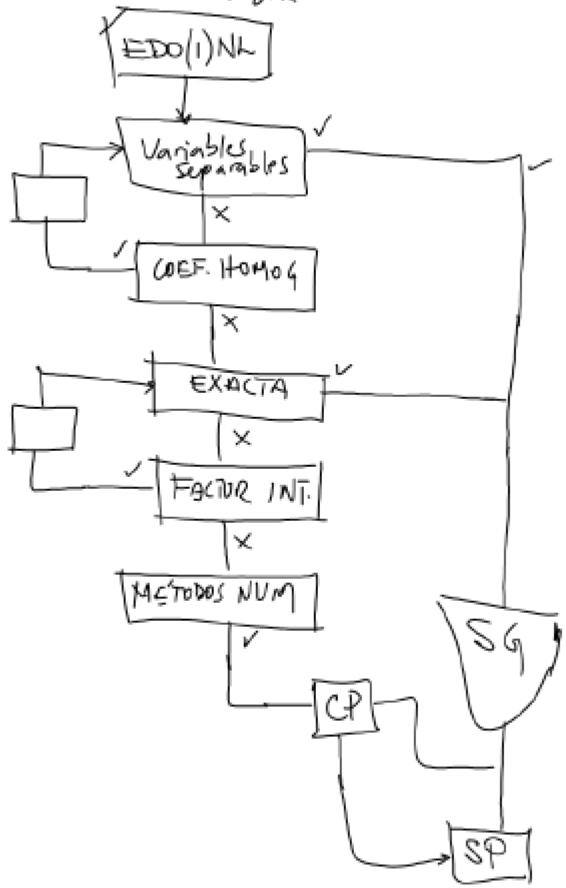
$$\frac{dy}{dx} = C$$

$$y = \frac{dy}{dx}x \longrightarrow \left.\begin{aligned} \frac{dy}{dx} &= \frac{y}{x} \\ \frac{\partial F}{\partial y} &= \frac{1}{x} \end{aligned}\right\} x \neq 0$$

$F(x,y)$

Métodos de solución de EDO(1) NL.

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



VARIABLES SEPARABLES

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

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

$$P(x)\cdot Q(y) + R(x)\cdot S(y)\frac{dy}{dx} = 0$$

$$\frac{P(x)}{R(x)}\,dx + \frac{S(y)}{Q(y)}\,dy = 0$$

$$\boxed{\int \frac{P(x)}{R(x)}\,dx + \int \frac{S(y)}{Q(y)}\,dy = C_1}$$

SOLUCIÓN GENERAL EDO(1)NL.

$$F_2(x,y) = C_1$$

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

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

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

$P(x)=x^2 \qquad Q(y)=1-y$

$R(x)=(1+x) \qquad S(y)=y^2$

$$\int\frac{x^2}{1+x}\,dx+\int\frac{y^2}{1-y}\,dy=C_1$$

$$\begin{array}{l|l} x^2 & 1+x \\ \hline -x^2-x & x-1 \\ \hline 0 \quad -x & \\ \quad\quad +x+1 & \end{array}$$

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

$$\begin{array}{l|l} y^2 & -y+1 \\ \hline -y^2+y & -y-1 \\ \hline 0 \quad y & \\ \quad\quad -y+1 & \end{array}$$

$$\boxed{\frac{x^2}{2}-x+\ln(x+1)-\frac{y^2}{2}-y-\ln(1-y)=C_1}$$

$$F(x,y)=C_1$$

Método de Coeficientes Homogéneos

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

$$\boxed{\begin{array}{lll} x \to \lambda x & M(\lambda x, \lambda y) = \lambda^m M(x,y) & \\ y \to \lambda y & N(\lambda x, \lambda y) = \lambda^n N(x,y) & m = n \end{array}}$$

CH

$$(4x^2 + xy - 3y^2) + (-5x^2 + 2xy + y^2)\frac{dy}{dx} = 0$$

$$4(\lambda x)^2 + (\lambda x)(\lambda y) - 3(\lambda y)^2 = 4\lambda^2 x^2 + \lambda^2 xy - 3\lambda^2 y^2$$

$$= \lambda^2(4x^2 + xy - 3y^2) \quad m = 2$$

$$-5(\lambda x)^2 + 2(\lambda x)(\lambda y) + (\lambda y)^2 = -5\lambda^2 x^2 + 2\lambda^2 xy + \lambda^2 y^2$$

$$= \lambda^2(-5x^2 + 2xy + y^2) \quad n = 2$$

$$m = n$$

$$y(x) = x \cdot u(x)$$

$$\frac{dy}{dx} = x\frac{du}{dx} + u$$

$$\left(4x^2+x(xu)-3(ux)^2\right)+\left(-5x^2+2x(ux)+(ux)^2\right)\left(x\frac{du}{dx}+u\right)=0$$

$$\left(4x^2+ux^2-3u^2x^2\right)+\left(-5x^2+2x^2u+u^2x^2\right)\left(x\frac{du}{dx}+u\right)=0$$

$$x^2\left(4+u-3u^2\right)+x^2\left(-5u+2u^2+u^3\right)+x^3\left(-5+2u+u^2\right)\frac{dy}{dx}=0$$

$$\left(4+u-3u^2-5u+2u^2+u^3\right)+x\left(-5+2u+u^2\right)\frac{dy}{dx}=0$$

$$\left(4-4u-u^2+u^3\right)+x\left(-5+2u+u^2\right)\frac{du}{dx}=0$$

$$\frac{dx}{x}+\frac{\left(-5+2u+u^2\right)}{4-4u-u^2+u^3}\,du=0$$

$$\int\frac{dx}{x}+\int\left(\qquad\right)du=c$$