ECUACIONES DIFERENCIALES ORDINARIAS
NO LINEALES DE PRIMER ORDEN.

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

BUSCAR SI EDO(1)NL ES VARIABLES SEPARABLES

$$M(x,y) = P(x) \cdot Q(y) \quad \& \quad N(x,y) = R(x) \cdot S(y)$$

SE DICE QUE EDO(1)NL ES DE V.S.

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

$$\frac{1}{R(x) \cdot Q(y)} \Rightarrow \frac{P(x) Q(y)}{R(x) Q(y)} + \frac{R(x) \cdot S(y)}{R(x) \cdot Q(y)} \cdot \frac{dy}{dx} = 0$$

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

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

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

$$\left[\int \frac{P}{R} dx \right] + C_1 + \left[\int \frac{S}{Q} dy \right] + C_2 = 0$$

$$\left[\int \frac{P}{R} dx \right] + \left[\int \frac{S}{Q} dy \right] = -C_1 - C_2$$

SOLUCIÓN GENERAL $\Rightarrow$ $$\boxed{\left[\int \frac{P}{R} dx \right] + \left[\int \frac{S}{Q} dy \right] = C}$$

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

$$\underbrace{M = x^2}_{P(x)}\underbrace{(1-y)}_{Q(y)} \longrightarrow \underbrace{N=(1+x)}_{R(x)}\underbrace{y^2}_{S(y)}$$

$P(x)=x^2 \quad Q(y)=1-y \quad R(x)=1+x \quad S(y)=y^2$

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

SOL. GRAL

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

Toda EDO tendrá una y sólo una SG

$$\boxed{EDO} \Longleftrightarrow \boxed{SG}$$

$$\boxed{x^3y - 3x^2y^2 + 4xy^3 = C} \quad SG$$

$$\frac{d}{dx} \Longrightarrow F(x,y)=C$$

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

$$\boxed{(3x^2y - 6xy^2 + 4y^3) + (x^3 - 6x^2y + 12xy^2)\frac{dy}{dx} = 0}$$

EDO(1)NL ⟶ será de coeficientes
cuando se cumpla la siguiente condición

$$M(\lambda x, \lambda y) = \lambda^m M(x,y) \quad \& \quad N(\lambda x, \lambda y) = \lambda^n N(x,y)$$

se dice que la EDO es de coef. homo. $\quad m = n$

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

$$\begin{aligned}
M(\lambda x, \lambda y) &= \lambda y + \sqrt{(\lambda x)^2 - (\lambda y)^2} \\
&= \lambda y + \sqrt{\lambda^2 x^2 - \lambda^2 y^2} \\
&= \lambda y + \sqrt{\lambda^2}\sqrt{x^2 - y^2} \\
&= \lambda y + \lambda\sqrt{x^2 - y^2} \\
&= \lambda\left(y + \sqrt{x^2 - y^2}\right) \implies m = 1
\end{aligned}$$

$$m = n$$

$$N(\lambda x, \lambda y) = \lambda x \implies n = 1$$

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El método propone

$$u = \frac{y}{x} \Rightarrow \boxed{y(x) = x \cdot u(x)}$$

$$\frac{dy}{dx} = x \cdot \frac{du}{dx} + u \cdot (1)$$

$$\left(x \cdot u + \sqrt{x^2 - (xu)^2}\right) - x\left(x \cdot \frac{du}{dx} + u\right) = 0$$

$$\left(\cancel{x u} + \sqrt{x^2(1-u^2)}\right) - \cancel{x u} + x^2 \frac{du}{dx} = 0$$

COEFICIENTES HOMOGENEOS

$$x\sqrt{1-u^2} - x^2 \frac{du}{dx} = 0$$

P · Q R · S

$$\frac{x \cdot dx}{x^2} - \frac{du}{\sqrt{1-u^2}} = 0$$

$$\int \frac{dx}{x} - \int \frac{du}{\sqrt{1-u^2}} = 0$$

$$Lx - \arg\operatorname{sen}(u) = C$$

$$u = \frac{y}{x}$$

Solución general.
$$\boxed{Lx - \arg\operatorname{sen}\left(\frac{y}{x}\right) = C}$$

$$\arg\operatorname{sen}\left(\frac{y}{x}\right) = Lx - C$$

$$\frac{y}{x} = \operatorname{sen}(Lx - C)$$

Solución general.
$$\boxed{y(x) = x \cdot \operatorname{sen}(Lx - C)}$$

· cuando una EDO(1)NL sea de coef. hom.

la sustitución $y = x \cdot u$ $\quad \frac{dy}{dx} = u + x\frac{du}{dx}$

nos conducirá siempre a una

EDO(1)NL de Variables separables