CLASE 04 - LA ECUACIÓN NO LINEAL PRIMER ORDEN
(CONTINÚA)

EDO(1)NL $\quad M(x,y) + N(x,y)\,y' = 0$

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

MÉTODO: ¿Variables separables?

si $\left\{ \begin{array}{l} M(x,y) \Rightarrow P(x)\cdot Q(y) \\ N(x,y) \Rightarrow R(x)\cdot S(y) \end{array} \right\}$ entonces.

SOL. GRAL. $\Rightarrow \int \frac{P(x)}{R(x)}dx + \int \frac{S(y)}{Q(y)}dy = C_1$

Método: COEFICIENTES HOMOGÉNEOS

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

¿Si es de Coef. Hom?

si $\begin{array}{l} x \to \lambda x \\ y \to \lambda y \end{array}$ $\begin{array}{l} M(\lambda x, \lambda y) = \lambda^m M(x,y) \\ N(\lambda x, \lambda y) = \lambda^n N(x,y) \end{array}$ & $m = n$ entonces.

se afirma que EDO(1)NL es de C. H.

$u = \frac{y}{x} \longrightarrow y = u\cdot x \qquad y' = u'x + u$

$$M(x, ux) + N(x, ux)(u'x + u) = 0$$

Mágicamente se vuelve de V.S.

$$\sqrt{x^2+y^2}+y - xy' = 0$$ ECUACIÓN

$$M(\lambda x, \lambda y) = \sqrt{(\lambda x)^2 + (\lambda y)^2} + (\lambda y) \Rightarrow \sqrt{\lambda^2(x^2+y^2)} + \lambda y$$

COEF. HOM.

$$= \sqrt{\lambda^2} \cdot \sqrt{x^2+y^2} + \lambda y$$

$$= \lambda\sqrt{x^2+y^2} + \lambda y \Rightarrow \lambda\left(\sqrt{x^2+y^2}+y\right) \quad m=1$$

$$N(\lambda x, \lambda y) = -(\lambda x) \Rightarrow \lambda(-x) \;;\; n=1 \;;\; m=n \;;$$

$$y = u \cdot x \longrightarrow y' = u'x + u$$

$$\sqrt{x^2+(ux)^2} + (ux) - x\cdot(u'x+u) = 0$$

$$\sqrt{x^2+u^2x^2} + \cancel{u}x - u'x^2 - \cancel{u}x = 0$$

$$\sqrt{x^2(u^2+1)} - u'x^2 = 0$$

$$\sqrt{x^2} \cdot \sqrt{u^2+1} - u'x^2 = 0$$

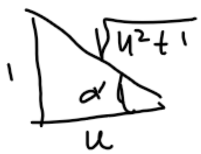
$$x\sqrt{u^2+1} - u'x^2 = 0$$

$$-\frac{1}{x} + \frac{u'}{\sqrt{u^2+1}} = 0$$

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

$$-\int \frac{dx}{x} + \int \frac{du}{\sqrt{u^2+1}} = C_1$$

$$-\ell x + \int \frac{du}{\sqrt{u^2+1}} = C_1$$



$$\frac{u}{1} = \cos(\alpha) \qquad du = -\mathrm{sen}(\alpha)\,d\alpha$$

$$\frac{1}{\sqrt{u^2+1}} = \mathrm{sen}(\alpha)$$

$$\int \frac{-\mathrm{sen}(\alpha)\,d\alpha}{\mathrm{sen}(\alpha)} = \int -d\alpha \Rightarrow -\alpha$$

$$\alpha = \mathrm{arg}\cos(u)$$

$$\boxed{-\mathcal{L}x + \mathrm{arg}\cos(u) = C_1}$$

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

SOL GEAL

$$\mathcal{L}\left(\frac{1}{x}\right) + \mathrm{arg}\cos\left(\frac{y}{x}\right) = C_1$$

$$\boxed{\text{EDO(1)NL} \qquad y' = \frac{2xy}{3x^2 - y^2}}$$

$$\underbrace{-2xy}_{M} + \underbrace{(3x^2 - y^2)}_{N}\, y' = 0$$

$$M(\lambda x, \lambda y) = 2(\lambda x)(\lambda y) \Rightarrow \lambda^2(2xy) \qquad m = 2$$

$$N(\lambda x, \lambda y) = 3(\lambda x)^2 - (\lambda y)^2 \Rightarrow \lambda^2(3x^2 - y^2) \qquad n = 2$$

$m = n$

CH.

$$\boxed{y = ux} \qquad \boxed{y' = u'x + u}$$

$$-2x(ux)+(3x^2-(ux)^2)(u'x+u)=0$$

$$-2ux^2+(3x^2-u^2x^2)u'x+u(3x^2-u^2x^2)=0$$

$$-2ux^2+3x^2u-u^2x^2+(x^2\cdot(3-u^2))u'x=0$$

$$x^2u-u^2x^2+x^3(3-u^2)u'=0$$

$$x^2(-u^2+u)+x^3(3-u^2)u'=0$$

$$\boxed{\frac{1}{x}+\frac{3-u^2}{-u^2+u}\frac{du}{dx}=0}$$ VS.

$$\frac{dx}{x}+\frac{3-u^2}{u-u^2}du=0$$

sust'

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

SOL GRAL $\int\frac{dx}{x}+\int\frac{3-u^2}{u-u^2}du=C_1$

SOL GRAL BONITA $\longrightarrow$ $$\boxed{\frac{y^3}{y^2-x^2}=C_1}$$

$$\int\frac{3-u^2}{u-u^2}du=u+3Lu-2L(u-1)$$

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

SOL GRAL FEA. $\rightarrow L(x)+\frac{y}{x}+3L\left(\frac{y}{x}\right)-2L\left(\frac{y}{x}-1\right)=C_1$