# EDO (1) NL.

- MÉTODOS
  - VARIABLES SEPARABLES
  - EXACTA.
  - FACTOR INTEGRANTE.

MÉTODO DE COEFICIENTES HOMOGENEOS

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

$F(x,y) \longrightarrow$

si $\quad F(\lambda x, \lambda y) = \lambda^n \cdot F(x,y) \quad \underline{n \in \mathbb{N}}.$

$$M(\lambda x, \lambda y) = \lambda^m M(x,y)$$

$$N(\lambda x, \lambda y) = \lambda^n N(x,y) \qquad m = n$$

ENTONCES

$$M(x,y) + N(x,y)\frac{dy}{dx} = 0$$ ES UNA EDO(1)NL DE C. H.

$$x\frac{dy}{dx}=\sqrt{x^2-y^2}+y$$

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

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

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

si $m=n$

$$\left(\sqrt{x^2-y^2}+y\right)-x\frac{dy}{dx}=0$$ EDO(1)NL COEF. HOMOGENEO/

Para resolver EDO(1)NL (CH).
será necesario hacer un cambio de var.

$$y=Vx\qquad \frac{dy}{dx}=V+x\frac{dV}{dx}$$

$$\left(\sqrt{x^2-(Vx)^2}+(Vx)\right)-x\left(V+x\frac{dV}{dx}\right)=0$$

$$\left(\sqrt{x^2-V^2x^2}+\cancel{Vx}-\cancel{Vx}-x^2\frac{dV}{dx}=0\right.$$

$$\sqrt{x^2(1-V^2)}-x^2\frac{dV}{dx}=0$$

$$\sqrt{x^2}\sqrt{1-V^2}-x^2\frac{dV}{dx}=0$$

$$x\sqrt{1-V^2}-x^2\frac{dV}{dx}=0$$

$$\left.\begin{array}{l}P(x)=x\\ Q(V)=\sqrt{1-V^2}\\ R(x)=-x^2\\ S(V)=1\end{array}\right\}\ \text{EDO(1)NL (VS)}$$

$$\frac{x\,dx}{x^2}-\frac{dV}{\sqrt{1-V^2}}=0$$


SG $$\int\frac{dx}{x}-\int\frac{dV}{\sqrt{1-V^2}}=C$$

$$\frac{V}{1}=\operatorname{sen}(\theta)$$

$$\frac{\sqrt{1-V^2}}{1}=\cos(\theta)$$

$$dV=\cos(\theta)\,d\theta$$

$$Lx-\int\frac{\cos(\theta)\,d\theta}{\cos(\theta)}=C$$

$$Lx-\int d\theta=C\qquad \theta=\operatorname{ang\,sen}(V)$$

$$Lx-\theta=C$$

$$Lx-\operatorname{ang\,sen}(V)=C\qquad y=Vx,\quad V=\frac{y}{x}$$

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

$$\operatorname{ang\,sen}\left(\frac{y}{x}\right)=C_1+Lx$$

$$\frac{y}{x}=\operatorname{sen}(C_1+Lx)$$

SG $$\boxed{y=x\operatorname{sen}(C_1+L(x)).}$$

EDO(1) L.C.V.N.H. FORMA GENERAL

$$a_0(x)\frac{dy}{dx}+a_1(x)\,y=Q(x).$$

FORMA SINTÉTICA.

$$\frac{dy}{dx}+\frac{a_1(x)}{a_0(x)}\,y=\frac{Q(x)}{a_0(x)}.$$

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

EDO(1) L C V NH.

Homogenea asociada

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

VARIABLES SEPARABLES.

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

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

SOL. $\rightarrow \int\frac{dy}{y}=\int-p(x)\,dx+C$

$$Ly=-\int p(x)\,dx+C$$

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

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

SOL GRAL EDO(1) L C V H.

$$y=C_1e^{-\int p(x)dx}.$$

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

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

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

$$N(x,y)=1.$$

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

NO ES EXACTA

BUSCAR FACTOR INTEGRANTE.

$$\mu(x) \Rightarrow \frac{d\mu(x)}{\mu(x)}=\left(\frac{\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}}{N}\right)dx.$$

$$\frac{d\mu(x)}{\mu(x)}=\left(\frac{p(x)-0}{1}\right)dx$$

$$\frac{d\mu(x)}{\mu(x)}=p(x)\,dx$$

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

$$L\,\mu(x)=\int p(x)dx.$$

FACTOR INTEGRANTE $\boxed{\mu(x)=e^{\int p(x)dx}}$

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

$$MM \qquad NN$$

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

$$\frac{\partial MM}{\partial y}=\frac{\partial NN}{\partial x}.$$

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

EXACTA.

$$\frac{dy}{dx} + p(x)y = 0 \longrightarrow y = Ce^{-\int p(x)dx}.$$

$$p(x)y + \frac{dy}{dx} = 0 \qquad \text{NO ES EXACTA.}$$

$$\text{F.I.}\ e^{\int p(x)dx}\ \underbrace{p(x)y}_{MM} + \underbrace{e^{\int p(x)dx}\frac{dy}{dx}}_{NN} = 0 \qquad \text{EXACTA.}$$

$$\text{SOL GRAL} \Rightarrow \int MM\,dx + \int\left(NN - \frac{\partial}{\partial y}\int MM\,dx\right)dy = C$$

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

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

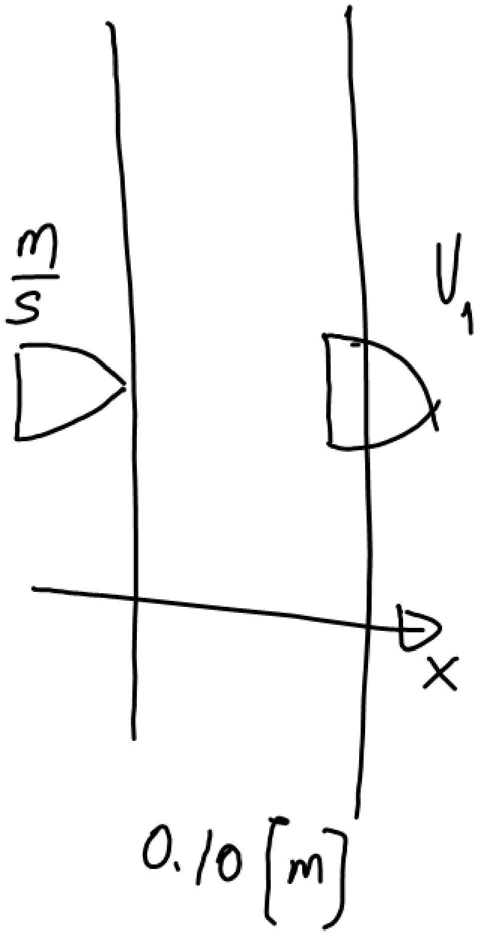
$$NN = e^{\int p(x)dx}$$

$$\text{SOL GRAL} \Rightarrow y e^{\int p(x)dx} = C$$

$$\boxed{y = Ce^{-\int p(x)dx}}$$

$V_0 = 200 \frac{m}{s}$

$V_1 = 80 \frac{m}{s}$




$V = \frac{dx}{dt}$

$\frac{dV}{dt} = -kV^2$

$t = ?$