$$\text{ED.} \begin{cases} F\left(x, y(x), \frac{dy}{dx}, \ldots\right) = 0 \\ G\left(x, y, z(x,y), \frac{\partial z}{\partial x}, \ldots\right) = 0 \end{cases}$$

Sol. forma que debe tomar la incógnita para satisfacer la ED.

Sol. satisface su ED si susti ella y sus derivadas la convierten en una identidad.

ED

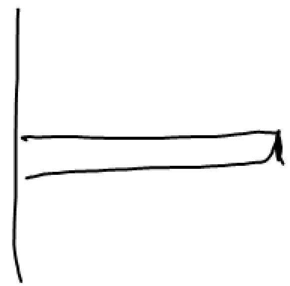
- ORDINARIOS
  - LINEALES
  - NO LINEALES
- EN DERIV. PARCIALES
  - LINEALES
  - CUASI LINEAL
  - NO LINEAL

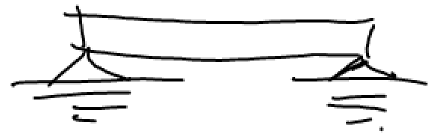
CUASI LINEAL

$$\frac{\partial z}{\partial x} + 5\frac{\partial z}{\partial y} = z^2$$

- EDO
  - LINEAL
    - 1 solo 1 SG.
    - ∞ SP
  - NO LINEAL
    - TIPO I.
      - 1 y solo SG
      - ∞ SP.
    - TIPO II.
      - 1 y sol. SG
      - ∞ SP.
      - # SS.

$$\text{COND}\begin{cases}\text{INICIALES} \\ \text{FRONTERA}\end{cases}$$





TRANSFORMADA DE LAPLACE.

PROBLEMAS EDO CON COND. INICIALES.

$$a_0(x)\frac{d^n y}{dx^n} + a_1(x)\frac{d^{n-1}y}{dx^{n-1}} + \dots + a_n(x)y = Q(x).$$

EDOL
- HOM: $Q(x) = 0$
- NO HOM: $Q(x) \neq 0$.

- CV
- CC: $\forall a_i(x) = k_i$, $i = 0 \dots n$.

- 1er orden
- $n > 1$.

Orden EDOL

$$y_g = C_1 y_1 + C_2 y_2 + \ldots + C_n y_n.$$

$y_i \Rightarrow$ Solución particular fundamental

Linealmente independientos

$$y = C_1 e^{2x} + C_2 \cos(3x) + C_3 \operatorname{sen}(3x).$$

EDOL (3) cc H.

$$\frac{dy}{dx} = 2C_1 e^{2x} - 3C_2 \operatorname{sen}(3x) + 3C_3 \cos(3x)$$

$$\frac{d^2y}{dx^2} = 4C_1 e^{2x} - 9C_2 \cos(3x) - 9C_3 \operatorname{sen}(3x)$$

$$\frac{d^3y}{dx^3} = 8C_1 e^{2x} + 27C_2 \operatorname{sen}(3x) - 27C_3 \cos(3x)$$

$$-2\frac{d^2y}{dx^2} = -8C_1 e^{2x} + 18C_2 \cos(3x) + 18C_3 \operatorname{sen}(3x)$$

$$\frac{d^3y}{dx^3} - 2\frac{d^2y}{dx^2} = (18C_2 - 27C_3)\cos(3x) + (27C_2 + 18C_3)\operatorname{sen}(3x)$$

EDONL (1)

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

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

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

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

$$\int M\,dx+\int\left(N-\frac{\partial}{\partial y}\int M\,dx\right)dy=C_1$$

F.I.

intfactor( )

$M+N\frac{dy}{dx}=0$ No EXCTA.

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

$$\frac{\partial \mu M}{\partial y}=\frac{\partial \mu N}{\partial x}$$

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

$\mu(x)$

$$\mu(x)\frac{\partial M}{\partial y}=\frac{d\mu}{dx}N+\mu\frac{\partial N}{\partial x}$$

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

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

$\mu(y)\Rightarrow$

$$\frac{d\mu}{\mu}=\left(\frac{-\frac{\partial M}{\partial y}+\frac{\partial N}{\partial x}}{M}\right)dy$$

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

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

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

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

$$\ln \mu = \int +p(x)\,dx$$

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

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

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

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

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

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

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

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

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

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

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

EDOL(1)CV NH.

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

COEFICIENTES HOMOGENEOS

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

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

$$y(x) = x \cdot u(x) \longrightarrow VS.$$

$$u(x) = \frac{y(x)}{x}.$$