ECUACIÓN DIFERENCIAL

$$F\left(x, f(x), f'(x)\right) = 0$$

EXPRESIÓN MATEMÁTICA QUE TIENE FORMA "ECUACIÓN" Y QUE CONTIENE, AL MENOS, UNA DE LAS DERIVADAS DE UNA FUNCIÓN DESCONOCIDA DENOMINADA "FUNCIÓN INCÓGNITA".

RESOLVER UNA E.D. ES BUSCAR Y ENCONTRAR LA FORMA DE LA "FUNCIÓN INCÓGNITA"

LA FORMA DE LA F.I. QUE SATISFACE LA E.D. SE DENOMINA "SOLUCIÓN"

TODA FUNCIÓN "SOLUCIÓN" DEBE SATISFACER SU E.D. CORRESP.

$0 \equiv 0$

$$\frac{d^2y}{dt^2} = -g$$

$$F(t, y(t), y'(t), y''(t)) = 0$$

$$F\left(\frac{d^2y}{dt^2}, g\right) = 0$$

$$\frac{d}{dt}\left(\frac{dy}{dt}\right) = -g$$

$$d\left(\frac{dy}{dt}\right) = -g\,dt$$

$$\int d\left(\frac{dy}{dt}\right) = -g\int dt$$

$$\frac{dy}{dt} + C_1 = -g(t + C_2)$$

$$\frac{dy}{dt} = -gt + (-C_1 - gC_2)$$

$$\frac{dy}{dt} = -gt + C_{10}$$

$$G\left(t, y(t), \frac{dy}{dt}\right) = 0$$

$$dy = (-gt + C_{10})\,dt$$

$$\int dy = -g\int t\,dt + C_{10}\int dt$$

$$y + C_3 = -g\left(\frac{t^2}{2} + C_4\right) + C_{10}(t + C_5)$$

$$y(t) = -\frac{g}{2}t^2 + C_{10}t + (-C_3 - gC_4 + C_{10}C_5)$$

$$\boxed{y(t) = -\frac{g}{2}t^2 + C_{10}t + C_{20}}$$ SOLUCIÓN

$$\boxed{\frac{d^2y}{dt^2} = -g}$$

$$\frac{dy}{dt} = -gt + C_{10} + (0)$$

$$\frac{d^2y}{dt^2} = -g + (0) \rightarrow [-g] = -g$$

$$-g + g = 0$$

$$0 = 0$$

$$\frac{d^2y}{dx^2} + 8\frac{dy}{dx} + 16y = 5e^{3x}$$

$$F\left(x, y(x), y'(x), y''(x)\right) = 0$$

$$y(x) = c_1 e^{-4x} + c_2 x e^{-4x} + \frac{5}{49} e^{3x}$$

$$F\left(x, y(x), \ldots, \frac{d^4y}{dx^4}\right) = 0$$

$$y(x) = c_1 y_1 + c_2 y_2 + c_3 y_3 + c_4 y_4$$

ED $\begin{cases} \text{ORDINARIAS} \\ \text{TEMAS 1, 2, 3} \\ \\ \text{EN DERIVADAS PARCIALES} \\ \text{TEMA 4} \end{cases}$

ORDINARIAS: $y(x)$

x = variable independiente.

EN DERIVADAS PARCIALES: $F(x, y, z)$

$x, y, z \Rightarrow$ var. indep.

$$F(x, y(x), y'(x)) = 0 \quad \text{ordinaria}$$

$$G\left(x, y, z, F(x,y,z), \frac{\partial F}{\partial x}, \frac{\partial F}{\partial y}, \frac{\partial F}{\partial z}, \frac{\partial^2 F}{\partial x \partial y}\right) = 0$$

ECUACIÓN DIFERENCIAL EN DERIVADAS PARCIALES

	TEMARIO	VIDA REAL
EDO	80%	15%
EDenDP	20%	85%

Orden de una ED.

La derivada de mayor orden define el orden ED.

En E.D.O. el orden nos dice cuántas constantes arbitrarias contiene su "Solución General".

SOLUCIÓN EDO

- GENERAL (UNA SÓLA SG)
- PARTICULAR ($\infty \rightarrow$ SP)
- SINGULAR (# SS) si es que existe.

$$y_g = C_1 y_1 + C_2 y_2 + C_3 y_3 + \dots + C_n y_n$$

EDO. orden "n"

$C_1 = 2 \quad C_2 = 3 \quad C_3 = 4 \quad C_4 \cdots C_n = 0$

$$y_p = 2y_1 + 3y_2 + 4y_3$$

$$\frac{d^2y}{dt^2} = -g \qquad y(0) = 2$$

$$y'(0) = V_0 \operatorname{sen}\left(\frac{\pi}{4}\right)$$

$$\frac{dx}{dt} = V_0 \cos\left(\frac{\pi}{4}\right) \qquad x(0) = 10$$

$$F = ma$$

$$-H_{ooke}\, s(t) = \frac{P}{g} \frac{d^2s}{dt^2}$$

$$\begin{cases} s(0) = 0.61 - 0.22 = 0.39 \\ s'(0) = 0 \end{cases}$$

$$y(x) = c_1 y_1 + c_2 y_2 + c_3 y_3$$

$c_1 = 1 \quad c_2 = c_3 = 0$

$y_p = y_1$

$c_1 = 0 \quad c_2 = 1 \quad c_3 = 0$

$y_p = y_2$

$c_1 = c_2 = 0 \quad c_3 = 1$

$y_p = y_3$

SOLUCIONES PARTICULARES FUNDAMENTALES

$$y_g = c_1 y_1 + c_2 y_2 + c_3 y_3$$

$$c_1, c_2, c_3 \in \mathbb{C}$$

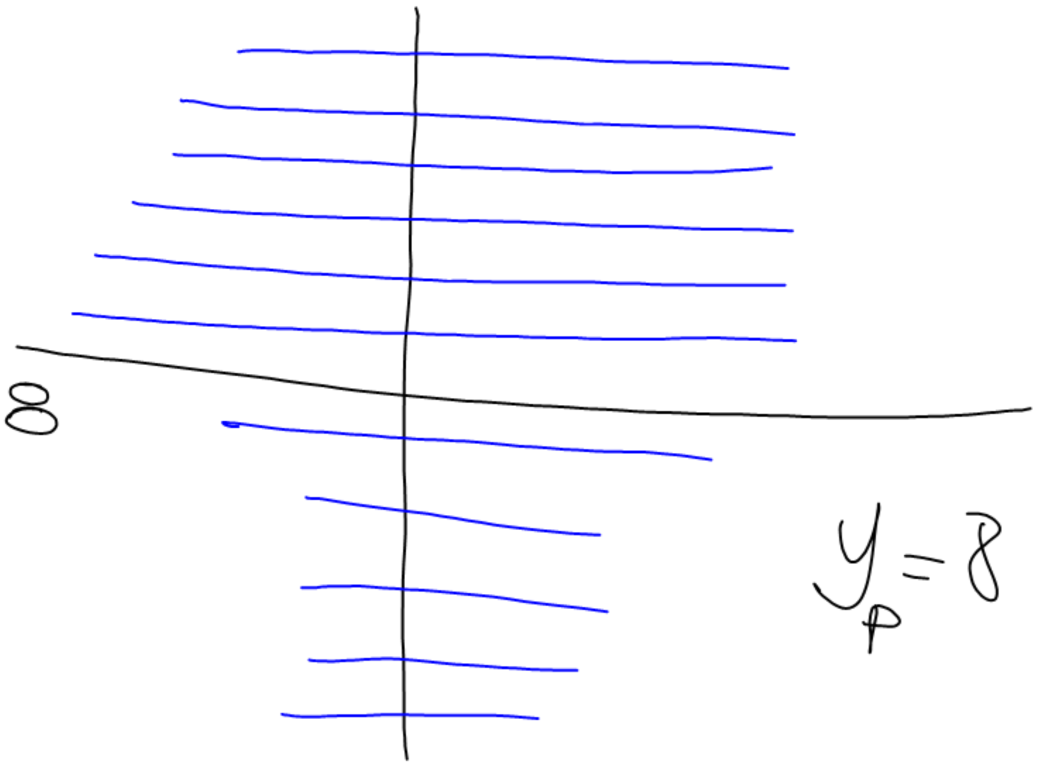
$$W(y_1, y_2, y_3) \neq 0$$

$$\begin{vmatrix} y_1 & y_2 & y_3 \\ y_1' & y_2' & y_3' \\ y_1'' & y_2'' & y_3'' \end{vmatrix} \neq 0$$

Solución general es una función paramétrica que representa a toda la familia de soluciones particulares.

$$\frac{dy}{dx} = 0 \qquad y_g = C_1 \qquad y_1 = 1$$

$$y(0) = 8$$



$$y_p = 8$$

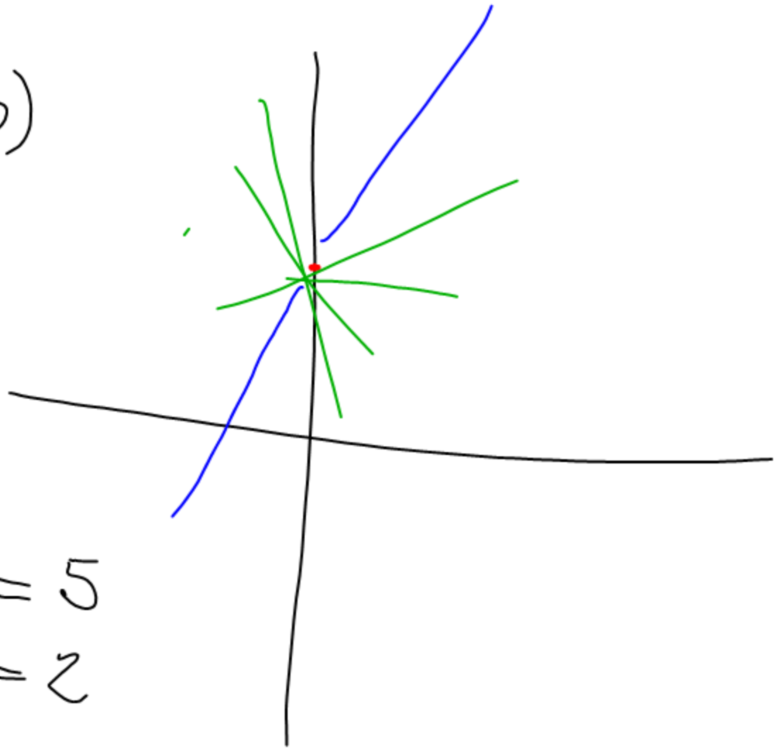
$$y_g = C_1 t + C_2$$

$$y_1 = t$$

$$y_2 = 1$$

$$\frac{dy}{dt} = C_1 + (0)$$

$$\frac{d^2y}{dt^2} = 0$$



$$y(0) = 5$$

$$y'(0) = 2$$

$$y_g = C_1 e^{2x} + C_2 e^{-2x}$$

$$y_1 = e^{2x}$$
$$y_2 = e^{-2x}$$

$$\begin{vmatrix} e^{2x} & e^{-2x} \\ 2e^{2x} & -2e^{-2x} \end{vmatrix} \neq 0$$

$$-2e^{2x}e^{-2x} - (2)e^{2x}e^{-2x} \neq 0$$

$$-4e^{2x}e^{-2x} \neq 0$$

$$\frac{dy}{dx} = 2C_1 e^{2x} - 2C_2 e^{-2x}$$

$$\frac{d^2y}{dx^2} = 4C_1 e^{2x} + 4C_2 e^{-2x}$$

$$y = C_1 e^{2x} + C_2 e^{-2x}$$

$$\boxed{\frac{d^2y}{dx^2} - 4y = 0}$$

EDO

- LINEALES
  - PRIM ORD.
    CAP. 1
  - ORDEN SUP 1
    CAP2
    - COEF. CTES
    - COEF. VAR.
      - HOM.
      - NO-HOM
- NO LINEALES
  - SOLS SINGULARES

EDO

- SOLAS
- SISTEMAS CAP. 3