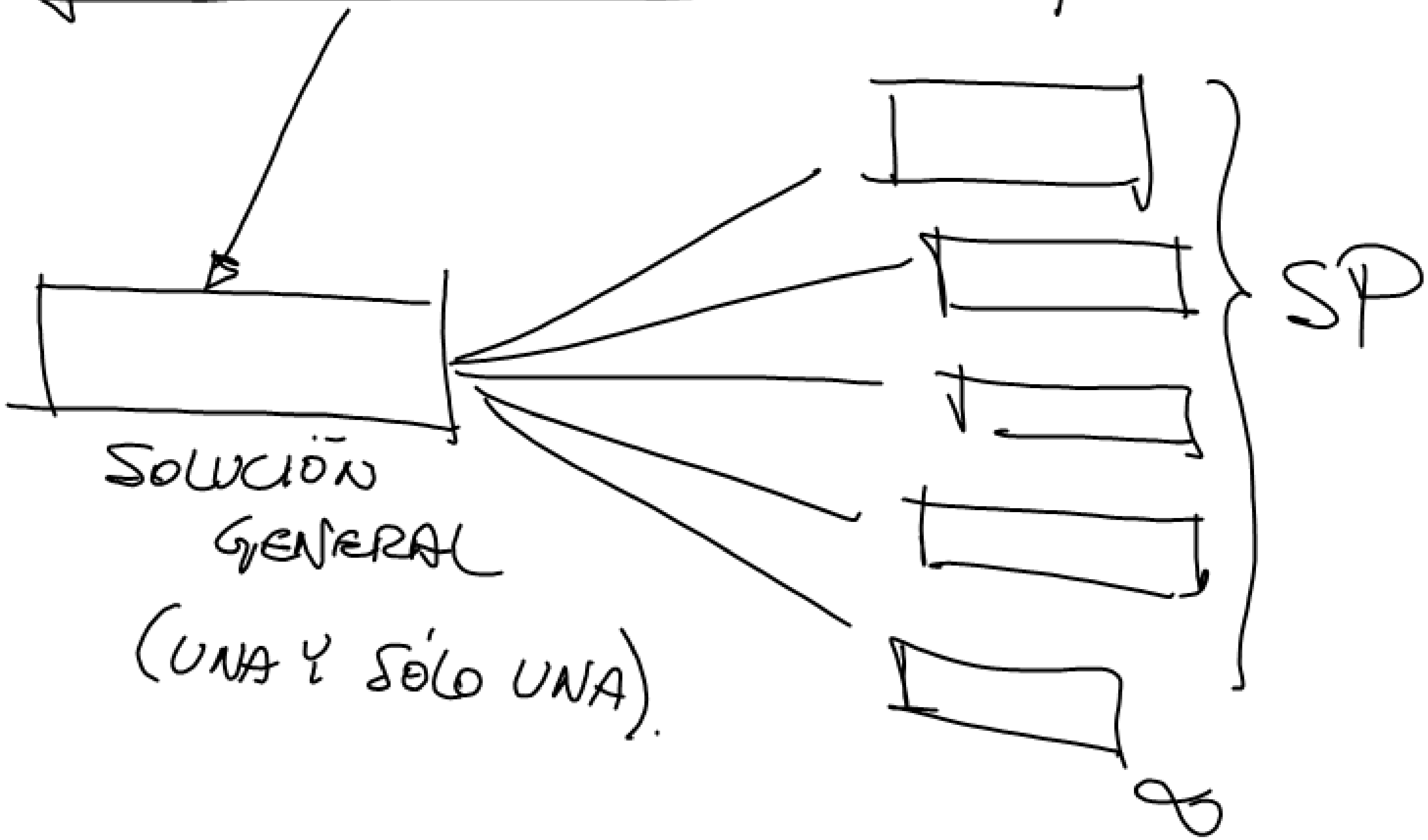
ECUACIONES DIFERENCIALES ORDINARIAS.

$$\frac{d^4y}{dx^4} - \frac{d^3y}{dx^3} = 0$$

$$F\left(\quad \frac{dy}{dx} \quad \right) = 0$$

$$y(x)$$

$$\boxed{F\left(x, y, \frac{dy}{dx}, \frac{d^2y}{dx^2}, \ldots\right) = 0} \quad \text{EDO}$$



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

$$\left.\begin{aligned} \frac{dy}{dx} &= C_1 e^{x} + 2C_2 e^{2x} \\ \frac{d^2y}{dx^2} &= C_1 e^{x} + 4C_2 e^{2x} \end{aligned}\right\}$$

$$C_1 e^{x} = \frac{dy}{dx} - 2C_2 e^{2x} \longrightarrow C_1 = e^{-x}\left(\frac{dy}{dx} - 2C_2 e^{2x}\right)$$

$$\frac{d^2y}{dx^2} = \left(\cancel{e^{-x}}\left(\frac{dy}{dx} - 2C_2 e^{2x}\right)\right)\cancel{e^{x}} + 4C_2 e^{2x}$$

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

$$2C_2 e^{2x} = \frac{d^2y}{dx^2} - \frac{dy}{dx} \longrightarrow \boxed{C_2 = \frac{e^{-2x}}{2}\left(\frac{d^2y}{dx^2} - \frac{dy}{dx}\right)}$$

$$C_1 = e^{-x}\left(\frac{dy}{dx} - \cancel{2}\left(\frac{\cancel{e^{-2x}}}{\cancel{2}}\left(\frac{d^2y}{dx^2} - \frac{dy}{dx}\right)\right)\cancel{e^{2x}}\right)$$

$$C_1 = e^{-x}\left(\frac{dy}{dx} - \frac{d^2y}{dx^2} + \frac{dy}{dx}\right) \Rightarrow \boxed{C_1 = e^{-x}\left(2\frac{dy}{dx} - \frac{d^2y}{dx^2}\right)}$$

$$\begin{bmatrix} e^{x} & 2e^{2x} \\ e^{x} & 4e^{2x} \end{bmatrix} \begin{bmatrix} C_1 \\ C_2 \end{bmatrix} = \begin{bmatrix} \frac{dy}{dx} \\ \frac{d^2y}{dx^2} \end{bmatrix}$$

$$C_1 = \frac{\begin{vmatrix} \frac{dy}{dx} & 2e^{2x} \\ \frac{d^2y}{dx^2} & 4e^{2x} \end{vmatrix}}{\begin{vmatrix} e^{x} & 2e^{2x} \\ e^{x} & 4e^{2x} \end{vmatrix}} \Rightarrow \frac{4e^{2x}\frac{dy}{dx} - 2e^{2x}\frac{d^2y}{dx^2}}{4e^{x}e^{2x} - 2e^{x}e^{2x}}$$

$$C_1 = \frac{\cancel{2e^{2x}}\left(2\frac{dy}{dx} - \frac{d^2y}{dx^2}\right)}{\cancel{2e^{2x}}e^{x}} \Rightarrow e^{-x}\left(2\frac{dy}{dx} - \frac{d^2y}{dx^2}\right)$$

$$C_2 = \frac{\begin{vmatrix} e^{x} & \frac{dy}{dx} \\ e^{x} & \frac{d^2y}{dx^2} \end{vmatrix}}{2e^{2x}e^{x}} \Rightarrow \frac{\cancel{e^{x}}\left(\frac{d^2y}{dx^3} - \frac{dy}{dx}\right)}{\cancel{e^{x}}\,2e^{2x}}$$

$$C_2 = \frac{e^{-2x}}{2}\left(\frac{d^2y}{dx^2} - \frac{dy}{dx}\right)$$

$$y = \left[\cancel{e^{-x}}\left(2\frac{dy}{dx} - \frac{d^2y}{dx^2}\right)\right]\cancel{e^{x}} + \left[\frac{\cancel{e^{-2x}}}{2}\left(\frac{d^2y}{dx^2} - \frac{dy}{dx}\right)\right]\cancel{e^{2x}}$$

$$y = 2\frac{dy}{dx} - \frac{d^2y}{dx^2} + \frac{1}{2}\frac{d^2y}{dx^2} - \frac{1}{2}\frac{dy}{dx}$$

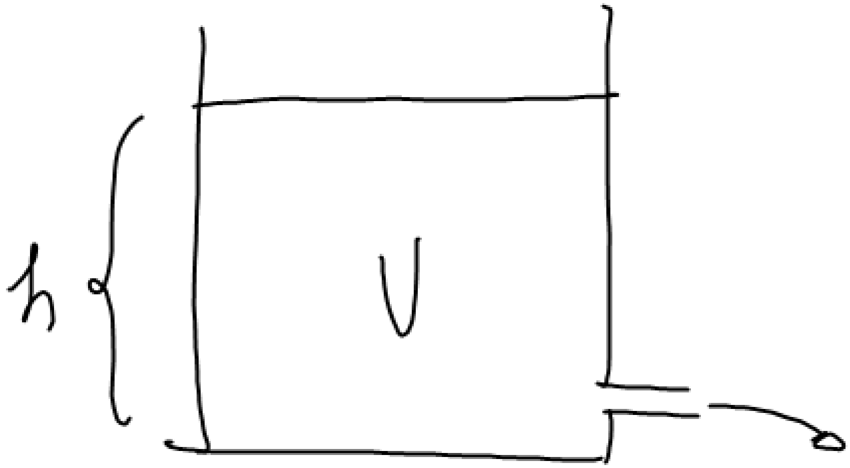
$$y = -\frac{1}{2}\frac{d^2y}{dx^2} + \frac{3}{2}\frac{dy}{dx}$$

$$2y = -\frac{d^2y}{dx^2} + 3\frac{dy}{dx}$$

$$\boxed{\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0}$$

ORDEN = 2

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



$81 \text{ km/h} \rightarrow 2 \text{ m.}$

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

$$g_{\text{salón}} = 9.80$$

$$\left.\begin{array}{l} \dfrac{dV}{dt} \\[2ex] \dfrac{dh}{dt} \end{array}\right\} \underline{\text{CAMBIO}}$$

$$\frac{d^2y}{dt^2} = -9.8 \quad \left[\frac{m}{s^2}\right]$$

$$\frac{d}{dt}\left(\frac{dy}{dt}\right) = -9.8$$

$$d\left(\frac{dy}{dt}\right) = -9.8\,dt$$

$$\int d\left(\frac{dy}{dt}\right) = -9.8\int dt.$$

$$\frac{dy}{dt} + k_1 = -9.8\left(t + k_2\right)$$

$$\frac{dy}{dt} = -9.8t + \left(-9.8k_2 - k_1\right)$$

$$\frac{dy}{dt} = -9.8t + C_1$$

$$dy = \left(-9.8t + C_1\right)dt$$

$$\int dy = -9.8\int t\,dt + C_1\int dt$$

$$\boxed{y = -9.8\left(\frac{t^2}{2}\right) + C_1 t + C_2}$$

SG

$y(0) = 2.0 \quad [m]$

$y'(0) = 0$

$$y(0) \Rightarrow 2 = -\frac{9.8}{2}(0) + C_1(0) + C_2$$

$$\boxed{C_2 = 2}$$

$$y'(0) \Rightarrow 0 = -9.8(0) + C_1$$

$$\boxed{C_1 = 0}$$

$$y_p = -\frac{9.8}{2}t^2 + 2$$

$$\frac{dy}{dt} = -9.8t$$

$y = 0$

$$+\frac{9.8}{2}t^2 = +2$$

$$t^2 = \frac{4}{9.8} \Rightarrow \pm\sqrt{\frac{4}{9.8}} \Rightarrow t = 0.6388 \text{ s.}$$

$$v_s = -9.8(0.6388) \Rightarrow -6.26 \times 3.6 \Rightarrow -22.53 \frac{km}{h}$$

TAREA # 2

Ed. I