EDOL(2)ccH.

$$\frac{d^2y}{dx^2} + a_1 \frac{dy}{dx} + a_2 y = 0$$

$$H_0 = y = e^{mx}$$

Ec Caract. $m^2 + a_1 m + a_2 = 0$ $\begin{cases} m_1 \\ m_2 \end{cases}$

Caso I- $m_1 \neq m_2 \in \mathbb{R}$

$$y_g = C_1 e^{m_1 x} + C_2 e^{m_2 x}$$

$$y_g = C_1 y_1 + C_2 y_2 \qquad y_1, y_2 \Rightarrow \text{SOL PART FUND.}$$

y_1 linealmente independiente de y_2

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

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

ECUACIÓN CARACTERÍSTICA DE LA EDO(2) L CC H.

m_1, m_2 } CASO I:- raíces reales y distintas

$$m_1 \neq m_2 \in \mathbb{R}$$

CASO II:- raíces iguales y reales

$$m_1 = m_2 \in \mathbb{R}$$

CASO III:- raíces complejas (distintas)

$$\left.\begin{array}{l} m_1 = a + bi \\ m_2 = a - bi \end{array}\right\} \in \mathbb{C} \quad (m_1 \neq m_2)$$

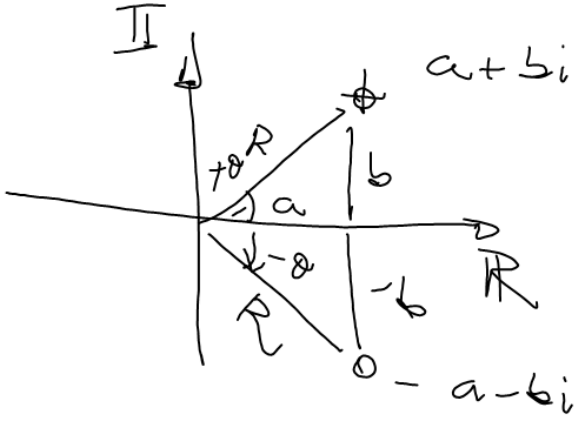
CASO III.- raíces complejas

$$y = C_1 e^{(a+bi)x} + C_2 e^{(a-bi)x}$$

$$y_g = C_1 e^{ax} e^{(bx)i} + C_2 e^{ax} e^{(-bx)i}$$

$$y_g \in \mathbb{R} \quad x \in \mathbb{R} \quad \left.\begin{matrix} C_1 \\ C_2 \end{matrix}\right\} \in \mathbb{C}$$

$$e^{\pi i} = -1$$ T. Euler



$$re^{\theta i} = r\cos(\theta) + [r\,\mathrm{sen}(\theta)]i$$
$$re^{-\theta i} = r\cos(\theta) - [r\,\mathrm{sen}(\theta)]i$$

$$y_g = C_1 e^{ax} e^{bxi} + C_2 e^{ax} e^{-bxi}$$
$$y_g = C_1 e^{ax}\left(\cos(bx) + [\mathrm{sen}(bx)]i\right) + C_2 e^{ax}\left(\cos(bx) - [\mathrm{sen}(bx)]i\right)$$
$$y_g = (C_1 + C_2)e^{ax}\cos(bx) + (C_1 i + C_2 i)e^{ax}\mathrm{sen}(bx)$$
$$y_g = C_{10} e^{ax}\cos(bx) + C_{20} e^{ax}\mathrm{sen}(bx).$$

$$m_1, m_2 = a \pm bi \quad \begin{matrix} a \in \mathbb{R} \\ b \in \mathbb{R}^+ \end{matrix}$$

$$y = C_1 e^{5x}\cos(2x) + C_2 e^{5x}\sin(2x)$$

EDO (2) L ... H.

$$\left.\begin{aligned} m_1 &= 5+2i \\ m_2 &= 5-2i \end{aligned}\right\} \text{ K}$$

ec. car. $\left(m-(5+2i)\right)\cdot\left(m-(5-2i)\right)=0$

$$\left((m-5)+2i\right)\left((m-5)-2i\right)=0$$

$$(m-5)^2-(2i)^2=0$$

$$m^2-10m+25+4=0$$

$$\boxed{\frac{d^2y}{dx^2}-10\frac{dy}{dx}+29y=0}$$

$m_1 = 4i \qquad m = -4i$

$y_g = C_1 \cos(4x) + C_2 \operatorname{sen}(4x)$

$(m - 4i)(m + 4i) = 0$

$\frac{d^2y}{dx^2} + 16y = 0$

$m^2 - (4i)^2 = 0$

$m^2 + 16 = 0$

$\frac{d^2y}{dx^2} - 16y = 0$

$m^2 - 16 = 0$

$(m - 4)(m + 4) = 0 \qquad m_1 = 4 \quad m_2 = -4$

$y = C_1 e^{4x} + C_2 e^{-4x}$

$m^2 + a_1 m + a_2 = 0$

$m_{1,2} = \frac{-a_1 \pm \sqrt{a_1^2 - 4a_2}}{2}$

CASO II.- $m_1 = m_2 \in \mathbb{R}$

$$y_g = C_1 e^{m_1 x} + C_2 (x e^{m_1 x})$$

$$m^2 + a_1 m + a_2 = 0$$

$$\frac{d}{dm}\left[(m - m_1)(m - m_2)\right] = 0 \qquad m_1 \neq m_2$$

$$(m - m_1) + (m - m_2) = 0$$

$$\frac{d}{dm}(m - m_1)^2 = 0 \qquad m_1 = m_2$$

$$2(m - m_1) = 0$$

$$\frac{d^2y}{dx^2} + a_1 \frac{dy}{dx} + a_2 y = 0$$

$$m^2 + a_1 m + a_2 = 0 \quad \begin{cases} m_1 = m_2 \end{cases}$$

$$\frac{dy}{dm} \begin{cases} y = e^{mx} \xrightarrow{m = m_1} e^{m_1 x} \quad y_{p_F} \\ y = x e^{mx} \xrightarrow{m = m_1} x e^{m_1 x} \end{cases}$$

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 0$$

$$m^2 - 6m + 9 = 0$$

$$(m-3)^2 = 0 \qquad m_1 = m_2 = 3.$$

$$y_1 = e^{3x} \longrightarrow y_2 = xe^{3x}$$

$$\frac{d^2y}{dx^2} = 0 \qquad m_1 = m_2 = 0$$

$$y_g = C_1 e^{m_1 x} + C_2 x e^{m_1 x}$$

$$y_g = C_1 + C_2 x$$

$$\frac{dy}{dx} = C_2 \longrightarrow \frac{d^2y}{dx^2} = 0$$

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

$$\frac{dy}{dx} = C_2$$

$$dy = C_2\,dx$$

$$\int dy = C_2 \int dx + C_3$$

$$y_g = C_2 x + (C_4 + C_3)$$

C_1

$$y_g = C_1 + C_2 x$$

$$\frac{d^3 y}{dt^3} = 0$$

$$m^3 = 0 \qquad m_1 = m_2 = m_3 = 0$$

$y = e^{m_1 t} \xrightarrow{m = m_1} 1$

$\frac{d}{dm}\left(y = t e^{m_1 t} \xrightarrow{m = m_1} t \right)$

$\frac{d}{dm}\left(y = t^2 e^{m_1 t} \xrightarrow{m = m_1} t^2 \right)$

$$y_g = C_1 + C_2 t + C_3 t^2$$

EDOL (4) cc H.

$$m^4 + a_1 m^3 + a_2 m^2 + a_3 m + a_4 = 0$$

$$\left.\begin{array}{l} m_{1,2} = a \pm bi \\ m_{3,4} = a \pm bi \end{array}\right\} \quad \begin{array}{l} m_1 = m_3 \\ m_2 = m_4 \end{array}$$

$$y_g = c_1 e^{ax} \cos(bx) + c_2 e^{ax} \operatorname{sen}(bx) + c_3 x e^{ax} \cos(bx) + c_4 x e^{ax} \operatorname{sen}(bx).$$

$$y_g = e^{2x}\left(C_1 + C_2 x + C_3\cos(5x) + C_4 \operatorname{sen}(5x)\right)$$

$$(m-2)^2\cdot\left(m-(-2+5i)\right)\left(m-(-2-5i)\right)=0$$

$$(m^2-4m+4)\left((m+2)^2-(5i)^2\right)=0$$

$$(m^2-4m+4)(m^2+2m+4+25)=0$$

$$m^4-2m^3+(4-8+1)m^2+(\ \ldots\ \ldots$$

$$\frac{d^4y}{dx^4}-2\frac{d^3y}{dx^3}+25\frac{d^2y}{dx^2}-108\frac{dy}{dx}+116y=0$$