Resolver la EDO(2)LCCH.

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

$$\boxed{\frac{dy}{dx} + a_1 y = 0} \qquad p(x) = a_1$$

$$y_g = c_1 e^{-\int a_1 dx} \Rightarrow y_g = c_1^{-a_1\int dx} \Rightarrow \boxed{y_g = c_1 e^{-a_1 x}}$$

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

$$y_g = C_1 y_1 + C_2 y_2 \qquad \left\{ \begin{array}{l} y_1 \\ y_2 \end{array} \right. \text{"Soluciones particulares fundamentales"}$$

Hipótesis $\quad y_i = e^{mx} \qquad m \in \mathbb{R}$

$$\frac{dy_i}{dx} = me^{mx}$$

$$\frac{d^2y_i}{dx} = m\left(me^{mx}\right) \Rightarrow m^2 e^{mx}$$

$$\left[m^2 e^{mx}\right] + a_1\left[m e^{mx}\right] + a_2\left[e^{mx}\right] = 0$$

$$(m^2 + a_1 m + a_2)\, e^{mx} = 0$$

$$\boxed{m^2 + a_1 m + a_2 = 0} \qquad e^{mx} = 0 \qquad \boxed{y_i = 0.}$$

Ecuación Característica de la ~~EDO~~(2) LccH. — trivial.

raíces $\begin{cases} m_1 \\ m_2 \end{cases}$ (supongo) $m_1 \neq m_2$

$$y_1 = e^{m_1 x}$$

$$y_2 = e^{m_2 x}$$

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

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

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

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

$$y_1 = e^{m_1 x} \qquad y_2 = e^{m_2 x}$$

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

$$\begin{vmatrix} e^{m_1 x} & e^{m_2 x} \\ m_1 e^{m_1 x} & m_2 e^{m_2 x} \end{vmatrix} \neq 0$$

$$m_2 e^{m_1 x} e^{m_2 x} - m_1 e^{m_1 x} e^{m_2 x} \neq 0$$

$$(m_2 - m_1) e^{m_1 x} e^{m_2 x} \neq 0$$

$$m_2 - m_1 \neq 0$$

$$m_2 \neq m_1$$

$$\boxed{\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0}$$

$$y_i = e^{mx}$$

$$\to m^2 - 5m + 6 = 0$$

$$(m-2)(m-3) = 0$$

$$m_1 = 2 \qquad m_2 = 3$$

$$m_2 \neq m_1$$

$$y_1 = e^{2x} \qquad y_2 = e^{3x}$$

$$\boxed{y_g = c_1 e^{2x} + c_2 e^{3x}}$$

$$\begin{vmatrix} e^{2x} & e^{3x} \\ 2e^{2x} & 3e^{3x} \end{vmatrix} \neq 0$$

$$3e^{5x} - 2e^{5x} \neq 0$$

$$e^{5x} \neq 0$$

Ecuación característica

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

$$m_1, m_2 \in \mathbb{R} \quad \begin{cases} m_2 \neq m_1 & \leftarrow \text{Tipo I} \\ m_2 = m_1 & \leftarrow \text{Tipo II} \end{cases}$$

$$m_1, m_2 \in \mathbb{C} \quad \leftarrow \text{Tipo III}$$

Tipo I.-

$$\boxed{y(x) = C_1 e^{m_1 x} + C_2 e^{m_2 x} \qquad m_1 \neq m_2 \in \mathbb{R}}$$

TIPO III

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

$$m^2 + a_1 m + a_2 = 0 \quad \Big\} \; m_2 , m_1 \in \mathbb{C}$$

$$\left.\begin{array}{l} m_1 = a + bi \\ m_2 = a - bi \end{array}\right\} \quad m_1 \neq m_2 \qquad a \in \mathbb{R} \quad b \in \mathbb{R}^+$$

$$y_1 = e^{(a+bi)x}$$

$$y_2 = e^{(a-bi)x}$$

$$y_g = c_1 e^{(a+bi)x} + c_2 e^{(a-bi)x}$$

$$y \in \mathbb{R} \quad x \in \mathbb{R}$$

Teorema Euler

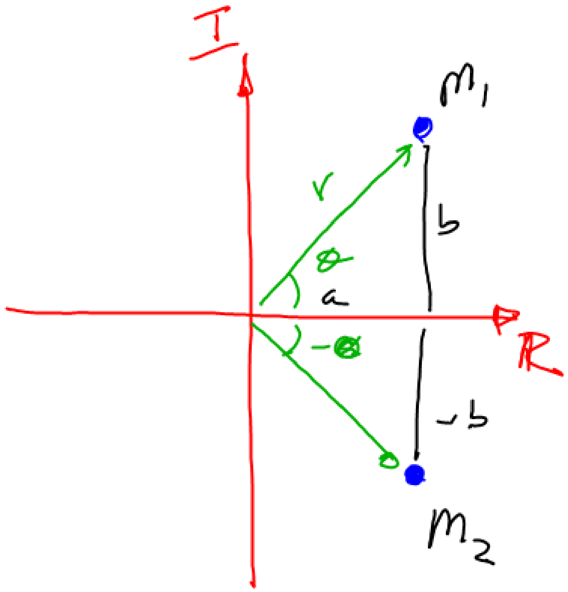
$$e = 2.71$$

$$\pi = 3.1416$$

$$i = \sqrt{-1}$$

$$1 \Rightarrow 1$$

$$\boxed{e^{\pi i} + 1 = 0}$$



$$m_1 = a + bi \Rightarrow r e^{\theta i}$$

$$m_2 = a - bi \Rightarrow r e^{-\theta i}$$

$$r e^{\theta i} = r\cos(\theta) + r\,\mathrm{sen}(\theta)\, i$$

$$r e^{-\theta i} = r\cos(\theta) - r\,\mathrm{sen}(\theta)\, i$$

$$e^{\theta i} = \cos(\theta) + \operatorname{sen}(\theta)\, i$$

π radianes

$$e^{\pi i} = \overset{-1}{\cancel{\cos}}(\pi) + \overset{0}{\cancel{\operatorname{sen}}}(\pi)\, i$$

$$e^{\pi i} = -1 \Rightarrow e^{\pi i} + 1 = 0$$

$$e^{(a+bi)x} \Rightarrow e^{ax} e^{bxi} \Rightarrow e^{ax}\left(\cos(bx) + \operatorname{sen}(bx)\, i\right)$$

$$e^{(a-bi)x} \Rightarrow e^{ax} e^{-bxi} \Rightarrow e^{ax}\left(\cos(bx) - \operatorname{sen}(bx)\, i\right)$$

$$y = C_1\left(e^{ax}\cos(bx) + e^{ax}\operatorname{sen}(bx)\,i\right) +$$

$$+ C_2\left(e^{ax}\cos(bx) - e^{ax}\operatorname{sen}(bx)\,i\right).$$

$$y = (C_1 + C_2)\,e^{ax}\cos(bx) + (C_1 i - C_2 i)\,e^{ax}\operatorname{sen}(bx)$$

$$y = C_{10}\,e^{ax}\cos(bx) + C_{20}\,e^{ax}\operatorname{sen}(bx) \ldots$$

$$m_1, m_2 = \{\, a \pm bi$$