TEMA II:- LA EDO LINEAL

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

EDO(2) LCCH.

$y_\phi = e^{mx}$

$m^2 + a_1 m + a_2 = 0$ E(0) Característica

TIPO I.- $\lambda_1 \neq \lambda_2 \in \mathbb{R} \Rightarrow y_{g/H} = C_1 e^{\lambda_1 x} + C_2 e^{\lambda_2 x}$

TIPO II.- $\lambda_1 = \lambda_2 \in \mathbb{R}$

TIPO III.- $\lambda_1 = a + bi \in \mathbb{C}$

$\lambda_2 = a - bi \in \mathbb{C}$

$\lambda_1 \neq \lambda_2 \in \mathbb{C}$

$$W = \begin{vmatrix} e^{\lambda_1 x} & e^{\lambda_2 x} \\ \lambda_1 e^{\lambda_1 x} & \lambda_2 e^{\lambda_2 x} \end{vmatrix} \neq 0$$

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

Tipo III.- $\lambda_1 \neq \lambda_2 \in \mathbb{C}$

$$\lambda_1 = a + bi \qquad \lambda_2 = a - bi$$

$$y_g = c_1 e^{(a+bi)x} + c_2 e^{(a-bi)x} \qquad \begin{matrix} y \in \mathbb{R} \\ x \in \mathbb{R} \end{matrix}$$

$$e^{(a+bi)x} \Rightarrow e^{ax} \cdot e^{bxi}$$

$$e^{(a-bi)x} \Rightarrow e^{ax} \cdot e^{-bxi}$$

$bx = \pi$

$e^{\pi i} = -1$

$$e^{bxi} = \cos(bx) + i \operatorname{sen}(bx)$$

$$e^{-bxi} = \cos(bx) - i \operatorname{sen}(bx)$$

$$y_{g/\mathbb{H}} = c_1 e^{ax} e^{bxi} + c_2 e^{ax} e^{-bxi}$$

$$= e^{ax}\left(c_1 e^{bxi} + c_2 e^{-bxi}\right)$$

$$= e^{ax}\left(c_1\left[\cos(bx) + i \operatorname{sen}(bx)\right] + c_2\left[\cos(bx) - i \operatorname{sen}(bx)\right]\right)$$

$$= e^{ax}\left(\left[c_1 + c_2\right]\cos(bx) + \left[c_1 i - c_2 i\right]\operatorname{sen}(bx)\right)$$

$$= e^{ax}\left(c_{10}\cos(bx) + c_{20}\operatorname{sen}(bx)\right]$$

$$y_g = c_{10} e^{ax}\cos(bx) + c_{20} e^{ax}\operatorname{sen}(bx)$$

TIPO II $\quad \lambda_1 = \lambda_2 \in \mathbb{R}$

$m^2 + a_1 m + a_2 = 0 \quad$ E(A) C.

$\frac{d}{dm}$

$y_p = e^{\lambda_1 x} \qquad \frac{\partial y_p}{\partial \lambda} = x e^{\lambda_1 x}$

$2m + a_1 = 0$

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

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

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

$\Rightarrow \quad y = e^{2x} \qquad y = x e^{2x}$

$e^{2x} \qquad \frac{\partial}{\partial \lambda} = x e^{\lambda x}$

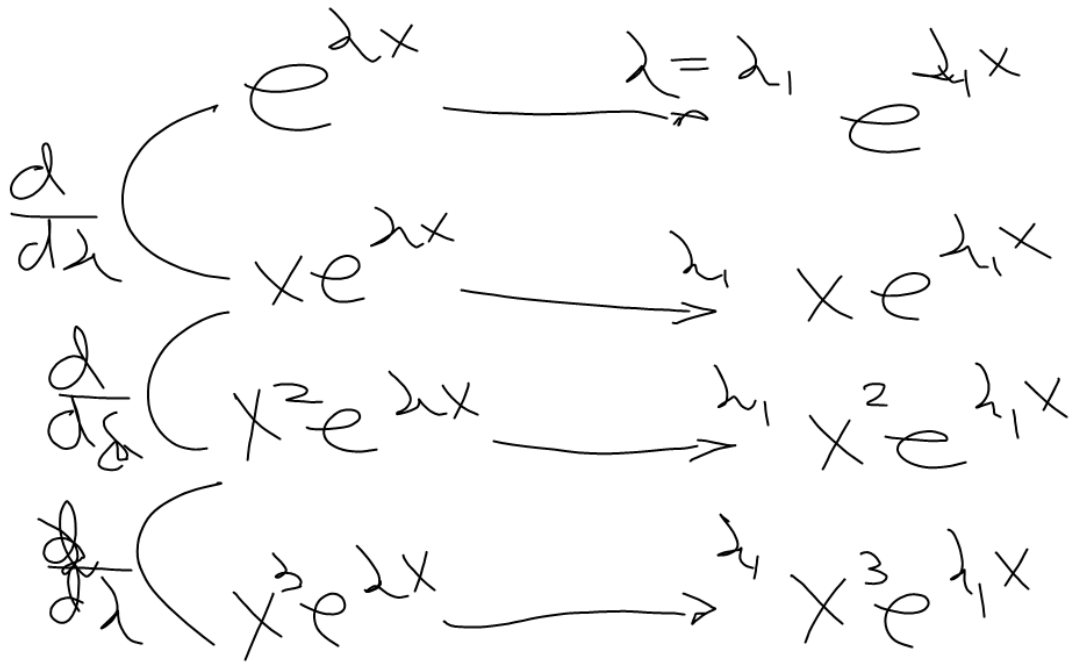
$y_g = C_1 e^{2x} + C_2 x e^{2x}$

$$(m-3)^4 = m^4 - 12m^3 + 54m^2 - 108m + 81 = 0$$

$$m_1 = m_2 = m_3 = m_4$$

$$y_g = C_1 e^{3x} + C_2 x e^{3x} + C_3 x^2 e^{3x} + C_4 x^3 e^{3x}$$

$$\frac{d^4y}{dx^4} - 12\frac{d^3y}{dx^3} + 54\frac{d^2y}{dx^2} - 108\frac{dy}{dx} + 8y = 0$$


$e^{\lambda x}$
$\lambda = \lambda_1$
$e^{\lambda_1 x}$
$\frac{d}{d\lambda}$
$x e^{\lambda x}$
λ_1
$x e^{\lambda_1 x}$
$\frac{d}{d\lambda}$
$x^2 e^{\lambda x}$
λ_1
$x^2 e^{\lambda_1 x}$
$\frac{d}{d\lambda}$
$x^3 e^{\lambda x}$
λ_1
$x^3 e^{\lambda_1 x}$

$$(m-4)(m^2+6m+9)=0$$

$$y_g = c_1 e^{4x} + c_2 e^{-3x} + c_3 x e^{-3x}$$

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

$$y = c_1 \cos(2x) + c_2 \operatorname{sen}(2x) + c_3 e^{-2x} + c_4 x e^{-2x}$$

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1er EXAMEN COLEGIADO: GIP I & II