NOTACIÓN

Leibnitz $\quad \dfrac{dy}{dx} \quad y(x)$

$y' \quad y(x) \Rightarrow y(t)$

Newton $\quad \dot{y} \quad y(t)$

Operador Diferencial

$D_x y \quad y(x)$

$D_t y \quad y(t)$

Dy

$$aD^2y + bDy \Longleftrightarrow \left(aD^2 + bD\right)[y]$$

$$a\frac{d^2y}{dx^2} + b\frac{dy}{dx}$$

$$D\left(g + h\right) \Longleftrightarrow Dg + Dh$$

$$D\left(D^n y\right) \Longleftrightarrow D^{n+1}[y]$$

$$D\left(D^{-1}y\right) \Longleftrightarrow y \qquad D^0 y = y$$

$$\int f\,dx = D^{-1}f + C_1$$

$$D\left[\int f\,dx\right] = D\left[D^{-1}f + C_1\right] \Rightarrow D^0 f + (0) = f$$

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 8y = 0$$

y''

$$D^2y - 6Dy + 8y = 0$$

$$(D^2 - 6D + 8)[y] = 0$$

$$m^2 - 6m + 8 = 0$$

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

$m_1 = 2 \quad m_2 = 4$

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

$$(D-2)(D-4)[y] = 0$$

$$y = C_1 e^{2x} + C_2 e^{4x}$$

$$(D-2)(D-4)\left[C_1 e^{2x} + C_2 e^{4x}\right] = 0$$

$$(D-2)\left[2C_1 e^{2x} + 4\cancel{C_2 e^{4x}} - 4C_1 e^{2x} - 4\cancel{C_2 e^{4x}}\right] = 0$$

$$(D-2)\left[-2C_1 e^{2x}\right] = 0$$

$$-2\left[2C_1 e^{2x}\right] - 2\left[-2C_1 e^{2x}\right] = 0$$

$$-4C_1 e^{2x} + 4C_1 e^{2x} = 0$$

$$0 = 0$$

EDO(1) L CV $\begin{cases} H \\ NH \end{cases}$

① $\dfrac{dy}{dx} + p(x)y = q(x)$

$$y = C_1 e^{-\int p(x)dx} + e^{-\int p(x)dx}\int e^{\int p(x)dx} q(x)dx$$

$$\frac{d^2y}{dx^2} + a_1\frac{dy}{dx} + a_2y = 0 \quad \text{EDO(2) L cc H.}$$

$$m^2 + a_1m + a_2 = 0 \quad \begin{cases} m_1 \\ m_2 \end{cases} \quad y = e^{mx}$$

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

$$y_g = C_1e^{m_1x} + C_2e^{m_2x}$$

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

$$y_g = C_1e^{m_1x} + C_2xe^{m_1x}$$

Caso III.- $m_1 \neq m_2 \in \mathbb{C}$ $\quad m_1 = a + bi \quad a \in \mathbb{R}$

$m_2 = a - bi \quad b \in \mathbb{R}^+$

$$y_g = C_1e^{ax}\cos(bx) + C_2e^{ax}\operatorname{sen}(bx)$$

$$\frac{d^2y}{dx^2} + a_1\frac{dy}{dx} + a_2 y = Q(x) \quad EDO(2)L\,cc\,\underline{NH}$$

MPV

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

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

$$y_{nh} = A(x)e^{m_1 x} + B(x)e^{m_2 x}$$

$$\begin{bmatrix} e^{m_1 x} & e^{m_2 x} \\ m_1 e^{m_1 x} & m_2 e^{m_2 x} \end{bmatrix} \begin{bmatrix} A'(x) \\ B'(x) \end{bmatrix} = \begin{bmatrix} 0 \\ Q(x) \end{bmatrix}$$

$$y = C_1 e^{x} + C_2 e^{x}\cos(x) + C_3 e^{x}\operatorname{sen}(x)$$

$$(D-1)\Big(D-(1+i)\Big)\Big(D-(1-i)\Big)[y] = 0$$

$$(D-1)\Big((D-1)^2+1\Big)[y] = 0$$

$$(D-1)(D^2-2D+2)[y] = 0$$

$$(D^3-3D^2+4D-2)[y] = 0$$

$$D^3y - 3D^2y + 4Dy - 2y = 0$$

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

$$(xD-4)(D-6)\,y \neq (D-6)(xD-4)\,y$$

$$(xD-4)(Dy-6y) =$$

$$(xD^2y - 6xDy - 4Dy + 24y$$

$$xD^2y + (-6xD - 4D)\,y + 24y$$

$$(D-6)(xDy-4y)$$

$$xD^2y + D^2y - 4Dy - 6xDy + 24y$$

$$(x+1)D^2y + (-4-6x)Dy + 24y$$

cond := $y(0)=5,\ D(y)(0)=4$

@ $\quad D@D(y)(0)$

$D(D(y))(0)$

MPU

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