Ecuaciones Diferenciales Ordinarias (2°) Lineales de coef. constantes No-homogéneas.

$$\frac{d^2y}{dx^2} + a_1\frac{dy}{dx} + a_2 y = Q(x) \qquad Q(x) \neq 0.$$

$$y_g = C_1 y_1^{(P)} + C_2 y_2^{(P)} + y_3^{(P)}$$

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FUNDAMENTALES

$$\frac{d^2y}{dx^2} + a_1 \frac{dy}{dx} + a_2 y = Q(x)$$

y_1, y_2:
- e^{mx}
- x^n $n \in E^{(+)}$ (serie completa)
- $\cos(bx)$, $\operatorname{sen}(bx)$ (por pareja) $b \in \mathbb{R}^+$

C.C.

$$y = C_1 e^{2x} + C_2 e^{3x} + \underbrace{e^{4x} + e^{5x}}_{y_3^{(P)}}$$

$y_1^{(P)}$, $y_2^{(P)}$

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

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

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

$$y_p = e^{4x} + e^{5x}$$

$$y' = 4e^{4x} + 5e^{5x}$$

$$y'' = 16e^{4x} + 25e^{5x}$$

$$Q = \left[16e^{4x} + 25e^{5x}\right] - 5\left[4e^{4x} + 5e^{5x}\right] + 6\left[e^{4x} + e^{5x}\right]$$

$$Q = (16 - 20 + 6)e^{4x} + (25 - 25 + 6)e^{5x}$$

$$Q = 2e^{4x} + 6e^{5x}$$

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 2e^{4x} + 6e^{5x}$$

$$y_g = c_1 e^{-x} + c_2 x e^{-x} + c_3 x^2 e^{-x} + 8x^3 e^{-x}$$

$$y_g = e^{-x}(c_1 + c_2 x + c_3 x^2 + 8x^3)$$

$$\frac{d^3y}{dx^3} + a_1 \frac{d^2y}{dx^2} + a_2 \frac{dy}{dx} + a_3 y = Q(x)$$

EDO (3) L cc NH

CASO II $\quad m_1 = m_2 = m_3 \Rightarrow -1$

$$(m+1)^3 = 0$$

1
1 1
1 2 1
1 3 3 1

$$m^3 + 3m^2 + 3m + 1 = 0$$

$$\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = Q. \longleftarrow$$

$$y_p = 8x^3 e^{-x} \rightarrow y' = 8(-x^3 e^{-x} + 3x^2 e^{-x})$$

$$y' = -8x^3 e^{-x} + 24x^2 e^{-x}$$

$$y'' = -8(-x^3 e^{-x} + 3x^2 e^{-x}) + 24(-x^2 e^{-x} + 2x e^{-x})$$

$$y'' = 8x^3 e^{-x} - 48 x^2 e^{-x} + 48x e^{-x}$$

$$y''' = 8(-x^3 e^{-x} + 3x^2 e^{-x}) - 48(-x^2 e^{-x} + 2x e^{-x}) + 48(-x e^{-x} + e^{-x})$$

$$y''' = -8x^3 e^{-x} + 72x^2 e^{-x} - 144x e^{-x} + 48e^{-x}$$

$$\begin{array}{r|l} y''' & -8x^3 e^{-x} + 72x^2 e^{-x} - 144x e^{-x} + 48e^{-x} \\ + & \\ 3y'' & 24x^3 e^{-x} - 144x^2 e^{-x} + 144x e^{-x} \\ + & \\ 3y' & -24x^3 e^{-x} + 72x^2 e^{-x} \\ + & \\ y & 8x^3 e^{-x} \end{array}$$

$$Q = (0)x^3 e^{-x} + (0)x^2 e^{-x} + (0)x e^{-x} + 48e^{-x}$$

$$\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 48e^{-x}.$$

$$y = e^{-x}(c_1 + c_2 x + c_3 x^2) + 8x^3 e^{-x}.$$

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

EDO(3) L cc H

1
1 1
1 2 1
1 3 3 1

$$m^3 - 3m^2 + 3m - 1 = 0$$

$$(m-1)^3 = 0 \qquad m_1 = m_2 = m_3 = 1 \quad \text{CASO II.}$$

$$e^{mx} \xrightarrow{m=1} e^x$$

$\frac{d}{dm}$

$$xe^{mx} \xrightarrow{m=1} xe^x$$

$\frac{d}{dm}$

$$x^2e^{mx} \xrightarrow{m=1} x^2e^x$$

$$y = C_1e^x + C_2xe^x + C_3x^2e^x$$

$$y = C_1xe^x + C_2x^2e^x + C_3x^3e^x$$

CC

CV

$$\frac{dy}{dx} + a_1 y = q(x) \qquad y_g = C_1 e^{-a_1 x} + e^{-a_1 x} \int e^{a_1 x} q\, dx.$$

$$\frac{dy}{dx} + p(x)\, y = q(x) \qquad y_g = C_1 e^{-\int p\,dx} + e^{-\int p\,dx} \int e^{\int p\,dx} q\, dx.$$

$$y_g = \left(C_1 + \int e^{a_1 x} q\, dx\right) e^{-a_1 x} \qquad \begin{cases} y_H = C_1 y_1 \\ y_{NH} = (C_1 + y_p)\, y_1 \end{cases}$$

$$y_g = \left(C_1 + \int e^{+\int p\,dx} q(x)\, dx\right) e^{-\int p\,dx} \qquad \begin{cases} y_H = C_1 y_1 \\ y_{NH} = (C_1 + y_p)\, y_1 \end{cases}$$

Si tenemos EDO(n) L $\left\{ \begin{matrix} CC \\ CV \end{matrix} \right\}$ NH.

$\downarrow$

Conocemos EDO(n) L $\left\{ \begin{matrix} CC \\ CV \end{matrix} \right\}$ H asociada

podemos resolverla por el.

MÉTODO DE COEFICIENTES (PARÁMETROS) VARIABLES

MPV

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 8y = 5e^{-3x}$$

EDO(2) L cc NH.

1

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

$m^2 - 6m + 8 = 0$ $\quad m_1 = 2$

$(m-2)(m-4) = 0$ $\quad m_2 = 4$ $\Big\}$ CASO I. $m_1 \neq m_2$

$$y_g = c_1 e^{2x} + c_2 e^{4x}$$

$$y_{n-h} = A(x)\, e^{2x} + B(x) e^{4x}$$

$$y_{n-h} = u_1(x) e^{2x} + u_2(x) e^{4x}$$

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 8y = 5e^{-3x}$$

$$y = A(x)e^{2x} + B(x)e^{4x}$$

$\frac{d}{dx}$

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