MPV

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

Homogenea asociada

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

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

$$y_H = c_1 e^{m_1 x} + c_2 e^{m_2 x}$$

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

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

$A'(x)$ $\qquad A(x) = \int A'(x)\,dx + C_1$

$B'(x)$ $\qquad B(x) = \int B'(x)\,dx + C_2$

$$\frac{d^4y}{dx^4} - 8\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 8y = 0 \qquad \begin{array}{l} y(0)=4 \\ y'(0)=2 \\ y''(0)=3 \\ y'''(0)=-1 \end{array}$$

EDO(4)LccH. $\longrightarrow$ S(4) EDO(1)L ccH.

$$y(x) \Rightarrow y_1(x) \qquad y_1(0)=4$$

$$\boxed{\begin{array}{ll} \dfrac{dy}{dx} \Rightarrow \dfrac{dy_1(x)}{dx} = y_2(x) & \qquad y_2(0)=2 \\ \dfrac{d^2y}{dx^2} \Rightarrow \dfrac{dy_2(x)}{dx} = y_3(x) & \qquad y_3(0)=3 \\ \dfrac{d^3y}{dx^3} \Rightarrow \dfrac{dy_3(x)}{dx} = y_4(x) & \qquad y_4(0)=-1 \end{array}}$$

$$\frac{d^4y}{dx^4} \Rightarrow \frac{dy_4(x)}{dx}$$

$$\boxed{\frac{dy_4(x)}{dx} = -8y_1(x) + 5y_2(x) - 6y_3(x) + 8y_4(x)}$$

S(4)EDO(1)L coH.

$$\frac{d}{dx}\begin{bmatrix} y_1(x) \\ y_2(x) \\ y_3(x) \\ y_4(x) \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -8 & 5 & -6 & 8 \end{bmatrix} \begin{bmatrix} y_1(x) \\ y_2(x) \\ y_3(x) \\ y_4(x) \end{bmatrix}$$

S(3)EDO(1)Lcc <u>NH</u>

$$\frac{dx_1(t)}{dt} = 2x_1 - 6x_2 + 3x_3 + 4e^{2t} + 6t^2$$

$$\frac{dx_2}{dt} = -x_1 + 8x_2 - 4x_3 + 2e^{2t} + 8t + 4$$

$$\frac{dx_3}{dt} = 3x_1 + 2x_2 - 9x_3 + 5t^2 - 2t + 1$$

$$\frac{d}{dt}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 2 & -6 & 3 \\ -1 & 8 & -4 \\ 3 & 2 & -9 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 4e^{2t} + 6t^2 \\ 2e^{2t} + 8t + 4 \\ 5t^2 - 2t + 1 \end{bmatrix}$$

$$\frac{d}{dt}\bar{x}(t) = A\bar{x}(t) + b(t)$$

$$\bar{x}(t) = e^{At}\bar{x}(0) + \int_0^t e^{A(t-z)} b(z)\,dz$$

$$\left[\int_0^t e^{A(t-z)} b(z)\,dz\right]_{t=0} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$