LINEALES

$$y = C_1 x + \frac{C_2}{x}$$

EDO(2) L CV H.

$$y' = C_1 - \frac{C_2}{x^2} \qquad y' = C_1 - \frac{y'' x^3}{2x^2}$$

$$y'' = +\frac{2C_2}{x^3} \longrightarrow C_2 = \frac{y'' x^3}{2}$$

$$C_2 = \frac{y'' x^3}{2} \qquad C_1 = y' + \frac{y'' x}{2}$$

$$y = \left(y' + \frac{y'' x}{2}\right) x + \frac{y'' x^3}{2x}$$

$$y = y'x + \frac{y'' x^2}{2} + \frac{y'' x^2}{2}$$

$$y = y'x + y'' x^2$$

$$\boxed{x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 0}$$ EDO(2) L CV H.

$$y = C_1 x + \frac{C_2}{x}$$

$$\boxed{x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 5x^2 Lx}$$ EDO(2) L CV NH

MPV

$$\left.\begin{aligned} y_{g/NH} &= A(x)x + \frac{B(x)}{x} \\ \frac{d^2y}{dx^2} + \frac{\frac{dy}{dx}}{x} - \frac{1}{x^2}\cdot y &= 5Lx \end{aligned}\right\}$$

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

$$y = C_1 x + \frac{C_2}{x}$$

$$\frac{dy}{dx} = C_1 - \frac{C_2}{x^2}$$

$$\frac{d^2y}{dx^2} = \frac{2C_2}{x^3}$$

$$\left[\frac{2C_2}{x^3}\right] + \frac{\left(C_1 - \frac{C_2}{x^2}\right)}{x} - \frac{\left(C_1 x + \frac{C_2}{x}\right)}{x^2} = 0$$

$$\frac{2C_2}{x^3} + \frac{C_1}{x} - \frac{C_2}{x^3} - \frac{C_1}{x} - \frac{C_2}{x^3} = 0$$

$$\left(\frac{2C_2}{x^3} - \frac{C_2}{x^3} - \frac{C_2}{x^2}\right) + \left(\frac{C_1}{x} - \frac{C_1}{x}\right) = 0$$

$$0 \equiv 0$$

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

$$y = A(x)\,x + \frac{B(x)}{x}$$

$$y_1 = x \qquad y_2 = \frac{1}{x}$$

MPV

$$\begin{bmatrix} x & \frac{1}{x} \\ 1 & -\frac{1}{x^2} \end{bmatrix} \begin{bmatrix} A'(x) \\ B'(x) \end{bmatrix} = \begin{bmatrix} 0 \\ 5Lx \end{bmatrix}$$

$$A'(x) = \frac{\begin{vmatrix} 0 & \frac{1}{x} \\ 5Lx & -\frac{1}{x^2} \end{vmatrix}}{\begin{vmatrix} x & \frac{1}{x} \\ 1 & -\frac{1}{x^2} \end{vmatrix}} \Rightarrow \frac{-\frac{5Lx}{x}}{-\frac{1}{x} - \frac{1}{x}} \Rightarrow \frac{-\frac{5Lx}{x}}{-\frac{2}{x}}$$

$$y(x) = \frac{c_1\left(x^2+1\right)}{x} + \frac{i\,c_2\left(x^2-1\right)}{2\,x} + \frac{5}{9}\,x^2\,(3\log(x)$$

$$\boxed{A'(x) = \frac{5}{2}Lx}$$

$$B'(x) = \frac{\begin{vmatrix} x & 0 \\ 1 & 5Lx \end{vmatrix}}{-\frac{2}{x}} \Rightarrow \frac{x\,5Lx}{-\frac{2}{x}} \Rightarrow \boxed{-\frac{5}{2}x^2 Lx}$$

$$\frac{5}{2}\int L(x)\,dx = \frac{5}{2}\,x\big(L(x) - 1\big) + C_1$$

$$\frac{5}{2}\frac{d}{dx}\Big(x\,(Lx-1)\Big) \Rightarrow \frac{5}{2}\left[x\left(\frac{1}{x}\right) + (Lx-1)\right] = \frac{5}{2}Lx.$$

$$-\frac{5}{2}\int x^2 Lx\,dx = -\frac{5}{18}x^3(3Lx-1) + C_2$$

$$y = \left[\frac{5}{2}x(Lx-1) + C_1\right]x + \frac{\left[-\frac{5}{18}x^3(3Lx-1) + C_2\right]}{x}$$

$$y = \frac{5}{2}x^2Lx - \frac{5}{2}x^2 + C_1x - \frac{15}{18}x^2Lx + \frac{5}{18}x^2 + \frac{C_2}{x}$$

$$y_g = C_1x + \frac{C_2}{x} + \left(\frac{5}{2} - \frac{15}{18}\right)x^2Lx + \left(-\frac{5}{2} + \frac{5}{18}\right)x^2$$

$$+ \left(\frac{45-15}{18}\right)x^2Lx + \left(\frac{-45+5}{18}\right)x^2$$

$$+ \frac{30}{18}x^2Lx - \frac{40}{18}x^2$$

$$y_g = C_1x + \frac{C_2}{x} + \frac{5}{3}x^2Lx - \frac{20}{9}x^2$$

$$y(x) = \frac{c_1\left(x^2+1\right)}{x} + \frac{i\,c_2\left(x^2-1\right)}{2\,x} + \frac{5}{9}\,x^2\,(3\log(x)-4)$$

$$y = c_1 x + \frac{c_1}{x} + \frac{i c_2}{2}x - \frac{\frac{i c_2}{2}}{x} + \frac{15}{9}x^2 \ln x - \frac{20}{9}x^2$$

$$= \left(c_1 + \frac{i c_2}{2}\right)x + \frac{\left(c_1 - \frac{i c_2}{2}\right)}{x} + \frac{5}{3}x^2 \ln x - \frac{20}{9}x^2$$

$$= c_{10}x + \frac{c_{20}}{x} + \frac{5}{3}x^2 \ln x - \frac{20}{9}x^2$$

$$\left\{\begin{array}{l} y_p = 3x + 4e^{2x} + 8\,\mathrm{sen}(2x) \\ y_p = 6 + 2x^2 + 9e^{2x} - 4\cos(2x) \\ y_p = 3 - x + 2\,\mathrm{sen}(2x) - 5\cos(2x) \\ y_p = -2 + x - 5x^2 - 2e^{2x} \end{array}\right.$$

$$= 7 + 3x - 3x^3 + 11e^{2x} + 10\,\mathrm{sen}(2x) - 9\cos(2x)$$

$$y_g = \underbrace{C_1 + C_2 x + C_3 x^2}_{} + \underbrace{C_4 e^{2x}}_{} + \underbrace{C_5\,\mathrm{sen}(2x) + C_6 \cos(2x)}_{}$$

EDO(6) L $\underline{\underline{\text{CC.}}}$ H.

$$m^3(m-2)(m-2i)(m+2i) = 0$$

$$(m^4 - 2m^3)(m^2+4) = 0$$

$$m^6 - 2m^5 + 4m^4 - 8m^3 = 0$$

$$\frac{d^6y}{dx^6} - 2\frac{d^5y}{dx^5} + 4\frac{d^4y}{dx^4} - 8\frac{d^3y}{dx^3} = 0$$

$$y = C_1 + C_2 x + C_3\,\mathrm{sen}(2x) + C_4\cos(2x) + 11e^{2x} - 3x^2$$

EDO(4) L CC NH.

Operador Diferencial - MCI. específico

MPV - general

$$\frac{dy}{dx} \Rightarrow D_x y \Rightarrow y' \Rightarrow \dot{y}$$

$$D_y D_y^{-1} = D_y^{0} \Rightarrow y$$

$$D(y+g) \Rightarrow Dy + Dg$$

$$(D^2 - 3D + 4)y \Rightarrow D^2y - 3Dy + 4y$$

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0 \qquad y_f = C_1e^{2x} + C_2e^{3x}$$

$$D^2y - 5Dy + 6y = 0$$

$$(D^2 - 5D + 6)y = 0$$

$$(D-2)(D-3)y = 0$$

$$(D-2)(D-3)\left[C_1e^{2x} + C_2e^{3x}\right] = 0$$

$$(D-2)\left[2C_1e^{2x} + \cancel{3C_2e^{3x}} - 3C_1e^{2x} - \cancel{3C_2e^{3x}}\right] = 0$$

$$(D-2)\left[-C_1e^{2x}\right] = 0$$

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

$$0 \equiv 0$$

$$\frac{d^2y}{dx^2} + 9y = 5\tan(3x)$$

$$\boxed{\begin{array}{lll} D^{n+1} & x^n & \Rightarrow 0 \\ (D-a) & e^{ax} & \Rightarrow 0 \\ (D^2+b^2) & \left\{ \begin{array}{l} \cos(bx) \\ \operatorname{sen}(bx) \end{array} \right\} & \Rightarrow 0 \end{array}}$$

MCI. EDO(n) L CC $\underline{\underline{\text{NH}}}$

$$\frac{dy}{dx}+a_1y=0 \qquad y_g=C_1e^{-a_1x}$$

$$\frac{dy}{dx}+p(x)y=0 \qquad y_g=C_1e^{-\int p(x)dx}$$

$$\frac{dy}{dx}+p(x)y=q(x) \qquad y_g=C_1e^{-\int p(x)dx}+e^{-\int p(x)dx}\int e^{\int p(x)dx}q(x)dx$$

$$\frac{dy}{dx}+a_1y=q(x) \qquad y_g=C_1e^{-a_1x}+e^{-a_1x}\int e^{a_1x}q(x)dx$$

$$\frac{d^2y}{dx^2}+a_1\frac{dy}{dx}+a_2y=0$$

$$m^2+a_1m+a_2=0 \qquad \begin{matrix} m_1 \\ m_2 \end{matrix}$$

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 $m_{1,2}=a \pm bi \in \mathbb{C}$ $\quad a \in \mathbb{R}$, $b \in \mathbb{R}^+$ $b \neq 0$

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

MPV $\qquad y_{g/NH}=A(x)y_1+B(x)y_2+\dots+R(x)y_k$