EDO(n)L cc NH.

Método del Operador Diferencial.

$$\left.\begin{array}{l} y' \\ \dot{y} \\ \dfrac{dy}{dx} \\ \boxed{D_x y} \end{array}\right\} \text{derivada de "}y\text{" respecto a "}x\text{"}$$

$Dy \qquad D^{-1}y \longrightarrow D^{-1}(Dy) = y$

$D^{0}y = y$

$D^{-1} \Rightarrow$ antiderivada

$D(Dy) = D^{2}y$

$(D+a)y = Dy + ay$

$f(t)$	Df
1	D
t	D^2
t^n	D^{n+1}
e^{at}	$(D-a)$
te^{at}	$(D-a)^2$
$t^n e^{at}$	$(D-a)^{n+1}$
$\cos(bt)$ $\text{sen}(bt)$	(D^2+b^2)
$e^{at}\cos(bt)$ $e^{at}\text{sen}(bt)$	$((D-a)^2+b^2)$
$te^{at}\cos(bt)$	$((D-a)^2+b^2)^2$

$$(D-a)[e^{at}]$$

$$D[e^{at}]-ae^{at}$$

$$\underbrace{ae^{at}-ae^{at}}_{=0.}$$

$$(D-a)^2\left[te^{at}\right]=0$$

$$(D-a)(D-a)\left[te^{at}\right]=0$$

$$(D-a)\left[\cancel{ate^{at}}+e^{at}-\cancel{ate^{at}}\right]=0$$

$$(D-a)\left[e^{at}\right]=0$$

$$ae^{at}-ae^{at}=0.$$

$$0=0$$

$$(D^2+b^2)\left[\cos(bt)+\operatorname{sen}(bt)\right]=0$$

$$D^2\left[\cos(bt)+\operatorname{sen}(bt)\right]+b^2\cos(bt)+b^2\operatorname{sen}(bt)=0$$

$$D\left[-b\operatorname{sen}(bt)+b\cos(bt)\right]+b^2\cos(bt)+b^2\operatorname{sen}(bt)=0$$

$$-b^2\cancel{\cos}(bt)-b^2\cancel{\operatorname{sen}}(bt)+b^2\cancel{\cos}(bt)+b^2\cancel{\operatorname{sen}}(bt)=0$$

$$0=0$$

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

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

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

$$\longrightarrow \quad y_g = c_1e^{2x} + c_2e^{3x}$$

$$(D-2)(D-3)\left[c_1e^{2x} + c_2e^{3x}\right] = 0$$

$$(D-2)\left[2c_1e^{2x} + \cancel{3c_2e^{3x}} - 3c_1e^{2x} - \cancel{3c_2e^{3x}}\right] = 0$$

$$(D-2)\left[-c_1e^{2x}\right] = 0$$

$$-2\cancel{c_1}e^{2x} + 2\cancel{c_1}e^{2x} = 0$$

$$0 \equiv 0$$

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 0$$

CASO II

$$(D^2 - 6D + 9)y = 0$$

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

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

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

$$(D^2 + 2D + 2)y = 0$$

CASO III

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

$$((D+1)^2 + 1^2)y = 0$$

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

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

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

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

$$y = C_1e^{2x} + C_2e^{4x}$$

EDO(2) L cc NH

$$(D-2)(D-4)y = 5e^{2x} + x^2 + (0)x + (0)$$

$$(D-2)(D-4)(D-2)_A D_A^3 y = 0$$

$$y = C_1e^{2x} + C_2e^{4x} + C_3xe^{2x} + C_4 + C_5x + C_6x^2$$ EDO(6) L cc H.

$$y_{p/a} = Axe^{2x} + B + Dx + Ex^2$$

$$\frac{dy}{dx} = 2Axe^{2x} + Ae^{2x} + (0) + D + 2Ex$$

$$\frac{d^2y}{dx^2} = 4Axe^{2x} + 4Ae^{2x} + (0) + 2E.$$

$$[4Axe^{2x} + 4Ae^{2x} + 2E] - 12Axe^{2x} - 6Ae^{2x} - 6D - 12Ex + 8Axe^{2x} + 8B + 8Dx + 8Ex^2$$

$$(4-12+8)Axe^{2x} \qquad = 5e^{2x} + x^2$$

$$(0)\cancel{Axe^{2x}} + (4-6)Ae^{2x} + (2E - 6D + 8B) + (-12E + 8D)x + (8E)x^2$$

$$-2A = 5 \qquad A = -\frac{5}{2}$$

$$2E - 6D + 8B = 0$$

$$-12E + 8D = 0 \qquad D = \frac{12}{64}$$

$$8E = 1 \qquad E = \frac{1}{8}$$

$$-\frac{72}{64} + \frac{1}{4} + 8B = 0$$

$$\frac{-72+16}{64} = -8B$$

$$B = \frac{-72+16}{64 \times 8}$$

$$y_{g/nh} = \underbrace{C_1e^{2x} + C_2e^{4x}}_{y_{g/h_a}} \underbrace{- \frac{5}{2}xe^{2x} + \left(\frac{-72+16}{64 \times 8}\right) + \frac{12}{64}x + \frac{1}{8}x^2}_{y_{p/a}}$$

$$\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 4\cos(2x)$$

$$(D^2 + D + 1)y = 0$$

$$\left(\left(D^2 + D + \tfrac{1}{4}\right) - \tfrac{1}{4} + 1\right)y = 0$$

$$\left(\left(D + \tfrac{1}{2}\right)^2 + \left(\tfrac{\sqrt{3}}{2}\right)^2\right)y = 0$$

$$y_{g/H} = c_1 e^{-\frac{1}{2}x}\cos\left(\tfrac{\sqrt{3}}{2}x\right) + c_2 e^{-\frac{1}{2}x}\operatorname{sen}\left(\tfrac{\sqrt{3}}{2}x\right)$$

$$\left(\left(D + \tfrac{1}{2}\right)^2 + \left(\tfrac{\sqrt{3}}{2}\right)^2\right)y = 4\cos(2x)$$

$$\left(\left(D + \tfrac{1}{2}\right)^2 + \left(\tfrac{\sqrt{3}}{2}\right)^2\right)\underbrace{(D^2 + 4)}_{A}y = 0$$

$$y_{P/Q} = A\cos(2x) + B(\operatorname{sen}(2x))$$

$$\frac{dy}{dx} = -2A\operatorname{sen}(2x) + 2B(\cos(2x))$$

$$\frac{d^2y}{dx^2} = -4A\cos(2x) - 4B(\operatorname{sen}(2x))$$

$$(D^2 + D + 1)y = 4\cos(2x)$$

$$(-4A + A)\cos(2x) + 2B\cos(2x) + (-4B + B)\operatorname{sen}(2x) +$$
$$\cancel{B} - 2A\operatorname{sen}(2x)$$

$$(-3A + 2B)\cos(2x) + (-3B - 2A)\operatorname{sen}(2x)$$

$$-3A + 2B = 4$$
$$-2A - 3B = 0$$

$$-6A + 4B = 8$$
$$+6A + 9B = 0$$

$$0 \quad 13B = 8 \qquad B = \frac{8}{13}$$

$$-2A = 3\left(\frac{8}{13}\right)$$
$$A = -\frac{12}{13}$$

$$y = c_1 e^{-\frac{1}{2}x}\cos\left(\tfrac{\sqrt{3}}{2}x\right) + c_2 e^{-\frac{1}{2}x}\operatorname{sen}\left(\tfrac{\sqrt{3}}{2}x\right) - \frac{12}{13}\cos(2x) + \frac{8}{13}\operatorname{sen}(2x)$$