

Ejercicio fracciones parciales

$$X(s) = \frac{2s^3 + 8s^2 + 4s + 8}{s(s+1)(s^2 + 4s + 8)}$$

$$\text{raíces de } s^2 + 4s + 8 \quad s = \frac{-4 \pm \sqrt{16 - (4 \cdot 8)}}{2} = \frac{-4 \pm \sqrt{-16}}{2} = -2 \pm 2j \quad \begin{matrix} s_1 = -2 + 2j \\ s_2 = -2 - 2j \end{matrix}$$

$$X(s) = \frac{2s^3 + 8s^2 + 4s + 8}{s(s+1)(s+2+2j)(s+2-2j)}$$

$$\text{f. parciales } \frac{A}{s} + \frac{B}{s+1} + \frac{C}{s+2+2j} + \frac{D}{s+2-2j} = \frac{2s^3 + 8s^2 + 4s + 8}{s(s+1)(s+2+2j)(s+2-2j)}$$

$$A(s+1)(s+2+2j)(s+2-2j) + B(s)(s+2+2j)(s+2-2j) + C(s)(s+1)(s+2-2j) + D(s)(s+1)(s+2+2j) = 2s^3 + 8s^2 + 4s + 8$$

$$1) \text{ Si } s=0 \quad A(1+2j)(1-2j) = 8 \quad A(8) = 8 \quad \underline{A=1}$$

$$2) \text{ Si } s=-1 \quad B(-1)(1+2j)(1-2j) = 2(-1) + 8 - 4 + 8 \quad -B \cdot (5) = 10 \quad \underline{B=-2}$$

$$3) \text{ Si } s=-2-2j \quad C(-2-2j)(-1-2j)(-4j) = 2(-2-2j)^3 + 8(-2-2j)^2 + 4(-2-2j) + 8$$

$$(-2-2j)^2 = 8j \quad \text{y} \quad (-2-2j)^3 = 8j(-2-2j) = (-16j+16) \quad \text{y} \quad (-2-2j)(-1-2j) = -2+6j$$

$$C(-2+6j)(-4j) = 2(16-16j) + 8(8j) - 8-8j+8$$

$$C(8j+24) = 32-32j+64j-8j \quad C = \frac{32+24j}{8j+24} \cdot \frac{(24-8j)}{(24-8j)} = \frac{960+320j}{640} = \underline{\underline{\frac{3+j}{2}}}$$

$$4) \text{ Si } s=-2+2j \quad D(-2+2j)(-1+2j)(4j) = 2(-2+2j)^3 + 8(-2+2j)^2 + 4(-2+2j) + 8$$

$$(-2+2j)^2 = -8j \quad \text{y} \quad (-2+2j)^3 = -8j(-2+2j) = (16j+16) \quad \text{y} \quad (-2+2j)(-1+2j) = -2-6j$$

$$D(4j)(-2-6j) = 2(16j+16) + 8(-8j) + 4(-2+2j) + 8$$

$$D(-8j+24) = 32j+32-64j-8+8j+8 \quad D = \frac{32-24j}{24-8j} \cdot \frac{(24+8j)}{(24+8j)} = \frac{960-320j}{640} = \underline{\underline{\frac{3-j}{2}}}$$

$$X(s) = \frac{1}{s} - \frac{2}{s+1} + \frac{(3+j)/2}{s+2+2j} + \frac{(3-j)/2}{s+2-2j} = \frac{1}{s} - \frac{2}{s+1} + \frac{1.5+0.5j}{s+2+2j} + \frac{1.5-0.5j}{s+2-2j}$$

$$X(s) = \frac{1}{s} - \frac{2}{s+1} + \frac{1,5+0,5j}{s+2+2j} + \frac{1,5-0,5j}{s+2-2j}$$

$$x(t) = 1 - 2e^{-t} + (1,5+0,5j)e^{-t(2+2j)} + (1,5-0,5j)e^{-t(2-2j)}$$

$$e^{-t(2+2j)} = e^{-2t} (\cos(-2t) + j \sin(-2t)) = e^{-2t} (\cos 2t - j \sin 2t)$$

$$e^{-t(2-2j)} = e^{-2t} (\cos(2t) + j \sin(2t))$$

$$x(t) = 1 - 2e^{-t} + e^{-2t} [(1,5+0,5j)(\cos 2t - j \sin 2t) + (1,5-0,5j)(\cos 2t + j \sin 2t)]$$

$$x(t) = 1 - 2e^{-t} + e^{-2t} [3 \cos 2t + 0,5 \sin 2t + 0,5 \sin 2t]$$

$$\underline{x(t) = 1 - 2e^{-t} + e^{-2t} (3 \cos 2t + \sin 2t)}$$