

# Tarea #5

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$$X(s) = \frac{2s^3 + 8s^2 + 4s + 8}{s(s+1)(s^2+4s+8)} = \frac{K_1}{s} + \frac{K_2}{s+1} + \frac{A}{s+2+2j} + \frac{A^*}{s+2-2j}$$

$$K_1 = s X(s) \Big|_{s=0}$$

$$K_1 = \cancel{s} \frac{2\cancel{s}^3 + 8\cancel{s}^2 + 4\cancel{s} + 8}{\cancel{s}(s+1)(s^2+4s+8)} \Big|_{s=0} = \frac{8}{8} = 1 \quad K_1 = 1$$

$$K_2 = (s+1) X(s) \Big|_{s=-1} \quad K_2 = \frac{(s+1) 2s^3 + 8s^2 + 4s + 8}{s(s+1)(s^2+4s+8)} \Big|_{s=-1}$$

$$K_2 = \frac{2(-1)^3 + 8(-1)^2 + 4(-1) + 8}{(-1)((-1)^2 + 4(-1) + 8)} = \frac{-2 + 8 - 4 + 8}{(-1)(1 - 4 + 8)} = \frac{10}{-5} \quad K_2 = -2$$

$$A = (s+2+2j) X(s) \Big|_{s=-2-2j} \quad A = (s+2+2j) \frac{2s^3 + 8s^2 + 4s + 8}{s(s+1)(s^2+4s+8)} \Big|_{s=-2-2j}$$

$$A = \frac{2s^3 + 8s^2 + 4s + 8}{s(s+1)(s-2-2j)} \Big|_{s=(-2-2j)}$$

$$2s^3 = 2[-2-2j]^3 = 2[(-2)^3 + 3(-2)^2(-2j) + 3(-2)(-2j)^2 + (-2j)^3]$$

$$(-2j)^3 = (-1)^3 j^3 2^3 = (-1)(j^2 \cdot j)(8) = (-1)(-j)(8) = 8j$$

$$2s^3 = 2[-8 - 24j + 24 + 8j] = 2[16 - j16] = 32 - 32j$$

$$8s^2 = 8(-2-2j)^2 = 8[(-2)^2 + 2(-2)(-2j) + (-2j)^2] = 8[4 + 8j + (-1)(4)] = 64j$$

$$\text{Numerador } 32 - 32j + 64j + 4(-2-2j) + 8 \rightarrow 32 - 32j + 64j - 8 - 8j + 8 \rightarrow 32 + 24j$$

$$\text{Denominador } s(s+1)(s+2+2j) = (-2-2j)(-2-2j+1)(-2-2j+2-2j) = 24j$$

$$A = \frac{32 + 24j}{24 + 8j} = \frac{8(4 + 3j)}{8(3 + j)} \cdot \frac{3-j}{3-j} = \frac{15 - 5j}{10} \quad A = 1.5 - 0.5j$$

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