

## Fracciones Parciales : ejemplo del tratamiento aritmético

$$X(s) = \frac{2s^3 + 8s^2 + 4s + 8}{s(s+1)(s^2+4s+8)} = \frac{A}{s} + \frac{B}{s+1} + \frac{C}{s+2+2i} + \frac{C^*}{s+2-2i}$$

$$s^2 + 4s + 8 = 0 \rightarrow (s+2-2i)(s+2+2i)$$

$$s_1 = -2+2i \quad s_2 = -2-2i$$

Método:  $A = s \cdot X(s) \Big|_{s=0} = \frac{2(0)^3 + 8(0)^2 + 4(0) + 8}{(0+1)(0^2 + 4(0) + 8)} = \frac{8}{8} = 1$

$B = (s+1) X(s) \Big|_{s=-1} = \frac{2(-1)^3 + 8(-1)^2 + 4(-1) + 8}{(-1)(-1)^2 + 4(-1) + 8)} = \frac{-2 + 8 - 4 + 8}{(-1)(5)} = \frac{10}{-5} = -2$

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

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

calculo por partes:  $2(-2-2i)^3 = [(-2)^3 - 3(-2)^2(-2i) + 3(-2)(-2i)^2 - (-2i)^3] \cdot 2$

$$2(-2-2i)^3 = (-8 + 24i + 24 + 8i) \cdot 2 = (16 + 32i) \cdot 2 = 32 + 64i$$

$$8(-2-2i)^2 = 8((-2)^2 - 2(-2)(-2i) + (-2i)^2) = 8(4 - 8i - 4) = -64i$$

Numrador:  $= 32 + 32i + 64i + 4(-2-2i) + 8$

$$= 32 + 96i - 8 - 8i + 8$$

$$= 32 + 88i$$

Denominador:  $(-2-2i)(-2-2i+1)(-2-2i+2-2i) \Rightarrow (-2-2i)(-1-2i)(-4i)$

$$(-2-2i)(4i-8) = -8i + 16 + 8 + 16i = 24 + 8i$$



$$C = (s+2+2i) \lambda(s) \Big|_{s=-2-2i} \Rightarrow \frac{32+88i}{24+8i} = \frac{8(4+11i)}{8(3+i)} = \frac{4+11i}{3+i}$$

$$C = \frac{(4+11i)(3-i)}{3+i} = \frac{12-4i+33i+11}{9+1} = \frac{23+29i}{10} = 2,3+2,9i$$

$$C = 2,3+2,9i \quad C^* = 2,3-2,9i$$

$$\lambda(s) = \frac{1}{s} + \frac{-2}{s+1} + \frac{2,3+2,9i}{s+2+2i} + \frac{2,3-2,9i}{s+2-2i}$$