Video 2.

Brayan Robato Pimiento Palacios 20202005042.

Fracciones Parciales

Ejemplo 1

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

En fracciones parciales

$$= \frac{K_1}{s} + \frac{K_2}{s+1} + \frac{A}{s+2+j2} + \frac{A^*}{s+2-j2}$$

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

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

$$K_2 = (s+1)Xs\Big|_{s=-1}$$

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

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

$$A = (s+2+j2)\,X(s)\Big|_{s=-2-i2}$$

$$A = (s+2+i2)\left(\frac{2s^3+8s^2+4s+8}{s(s+1)(s^2+4s+8)}\right)\Big|_{s=-2+j2}$$

$$A = (s+2+j2)\left(\frac{2s^3+8s^2+4s+8}{s(s+1)(s+2+j2)(s+2-j2)}\right)\Big|_{s=-2-j2}$$

$$A = \frac{2(-2-j2)^3+8[-2-j2)^2+4(-2-j2)+8}{(-2-j2)[(-2-j2)+1][(-2-j2)^2+4(-2-j2+8]}$$

Resolvendo por partes

$$2s^3 = 2[-2-j2]^3$$

$$= 2[(-2)^3+3(-2)^2(-j2)+3(-2)(-j2)^2+(-j2)^3]$$

$-j24$ e 24

$$(-j2)^3 = (-1)^3 j^3 2^3$$
$$= -1 \cdot j^2 j 8$$
$$= -8(-1)j$$
$$= j8$$

$$2s^3 = 2[-8-j24+24+j8]$$

$$2s^3 = 2[16-j16]$$

$$\boxed{2s^3 = 32-j32}$$

$$8s^2 = 8[-2+j2]^2$$
$$8s^2 = 8[4+2(4j)-4]$$
$$8s^2 = 8[8j]$$
$$\boxed{8s^2 = j64}$$

Numerador: $32-j32+j64+4(-2-j2)+8$
$+ 8-j8+8$

$$\boxed{32+j24}$$

Denominador: $(-2-j2)(-2-j2+1)(-2-j2+2-j2)$

$(-2-j2)(-2-j2+1)(-j4)$

$(j8-8)(-1+j2)$

$-j8+16+8+j16$

$\boxed{24+j8}$

$$A = \frac{32+j24}{24+j8} = \frac{8(4+j3)}{8(3+j)} = \frac{4+j3}{3+j} \cdot \frac{3-j}{3-j} = \frac{12-4j+9j+3}{9-j3+j3+1}$$

$$A = \frac{15+5j}{10} = \frac{3+j}{2} = 1,5 + j0,5$$

$$A = \boxed{1,5 + j0,5}$$

Finalmente se tiene:

$$X(s) = \frac{1}{s} - \frac{2}{s+1} + \frac{1,5+j0,5}{s+2+j2} + \frac{1,5-j0,5}{s+2-j2}$$