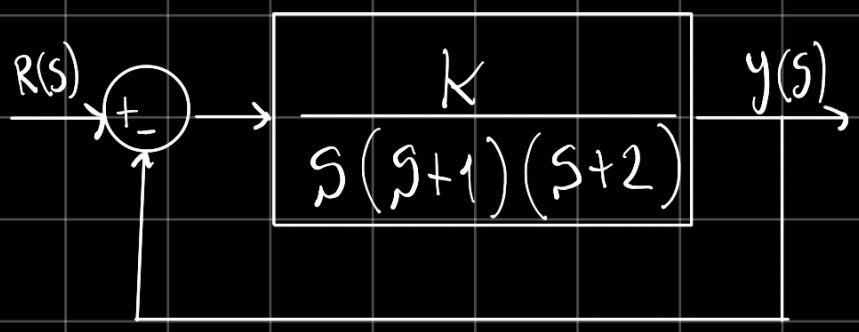


$$\frac{y(s)}{R(s)} = \frac{G(s)}{1+G(s)H(s)}$$

Ec. Característica

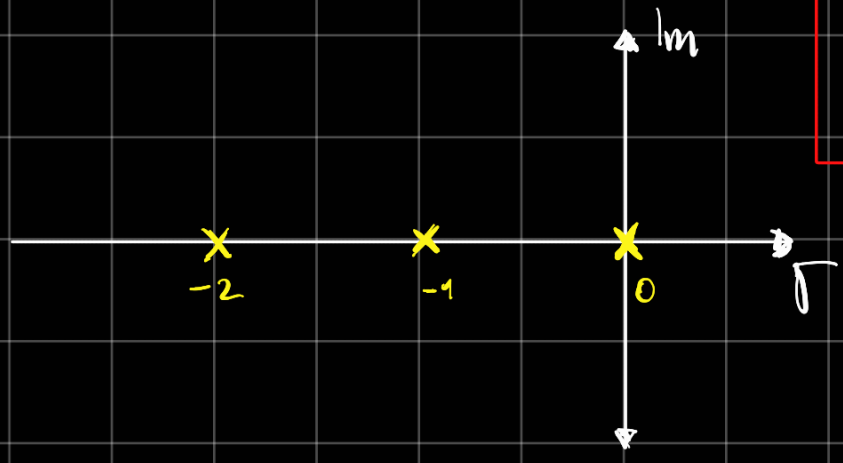
$$1 + \frac{K}{S(S+1)(S+2)} = 0 \rightarrow$$

$$P(S,K) = \underbrace{S(S+1)(S+2)}_{A(S)} + \underbrace{K}_{B(S)} = 0 \rightarrow A(S) = S(S+1)(S+2)$$

$$B(S) = 1$$

$n = 3$ polos

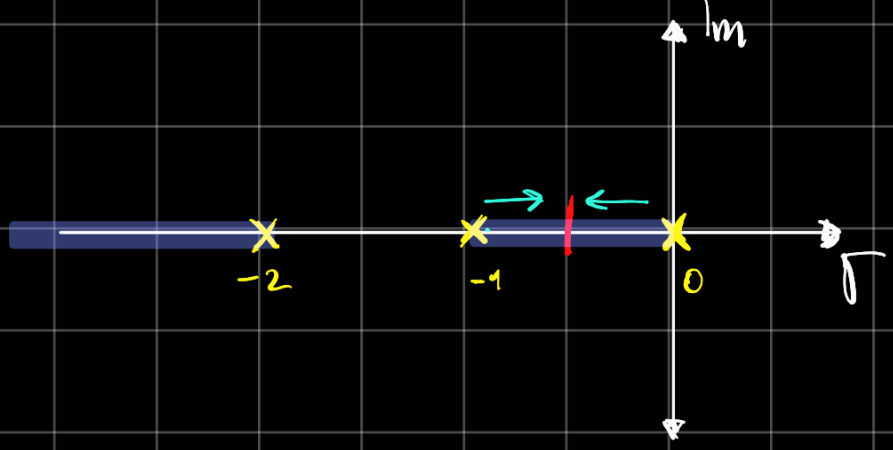
$m = 0$ ceros



Asíntotas $\rightarrow$ $n - m = 3 - 0 = 3$ asíntotas para Infinito

La ganancia K es ¿positiva o negativa?

$K > 0$ o $K < 0$??



Comportamiento asintotico:

$$\frac{2\pi}{n-m} = \frac{2\pi}{3-0} = \frac{2\pi}{3} = 120^\circ$$

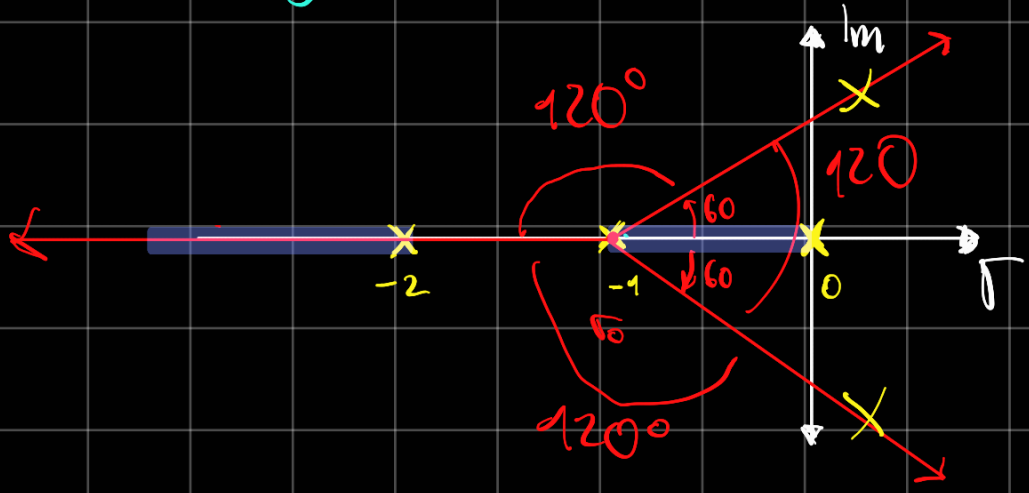
Cruce de las asintotas con el eje real

$$\sigma_0 = \frac{\sum p_i - \sum z_i}{n-m}$$

$$A(s) = s(s+1)(s+2) \qquad \begin{matrix} 0 & -1 & -2 \\ \uparrow & \uparrow & \uparrow \end{matrix}$$

$$B(s) = 1$$

$$\sigma_0 = \frac{0-1-2-0}{3} = \frac{-3}{3} = -1$$



Polos adyacentes en el eje real:

$$A(s) = s(s+1)(s+2)$$

$$B(s) = 1$$

$$s^3 + 3s^2 + 2s$$

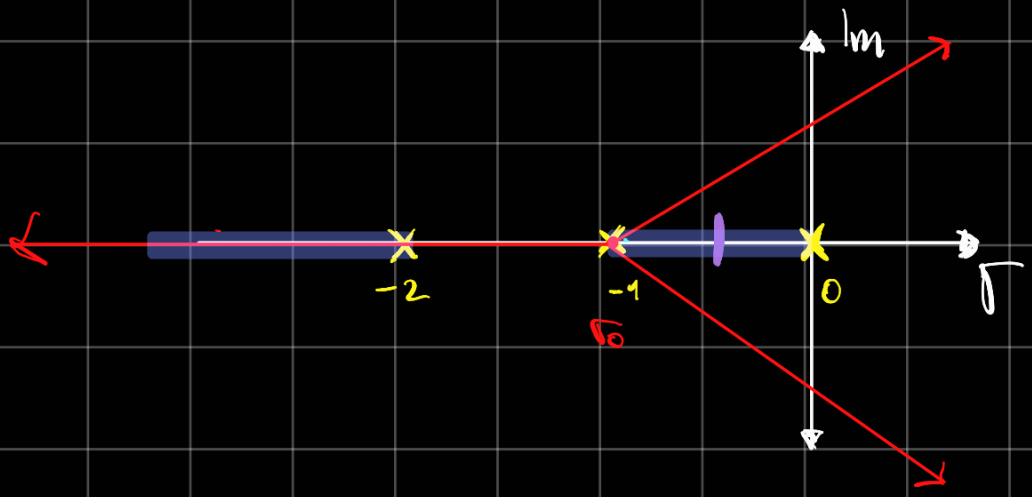
$$\left[B\frac{dA}{ds} - A\frac{dB}{ds} \right]_{rm} = 0$$

$$\left[3s^2 + 6s + 2 - (s^3 + 3s^2 + 2s)(0) \right] = 0$$

$$3s^2 + 6s + 2 = 0 \longrightarrow$$

$s_1 = -0{,}4226$ ✓ Dentro LGR

$s_2 = -1{,}5774$ ✗ fuera LGR



Cruce con el eje Imaginario:

$$P(s,K) = A(s) + KB(s) = 0$$

$$s^3 + 3s^2 + 2s + K = 0 \longrightarrow \text{Ec. Característica}$$

$s = jw$

$$(jw)^3 + 3(jw)^2 + 2(jw) + K = 0$$

$j = \sqrt{-1}$

$j^2 = -1$

$j^3 = jj^2 = -j$

$$-jw^3 - 3w^2 + 2jw + K = 0$$

$$\underbrace{-3w^2 + K}_{\text{real}} + j\underbrace{(2w - w^3)}_{\text{Imaginaria}} = 0$$

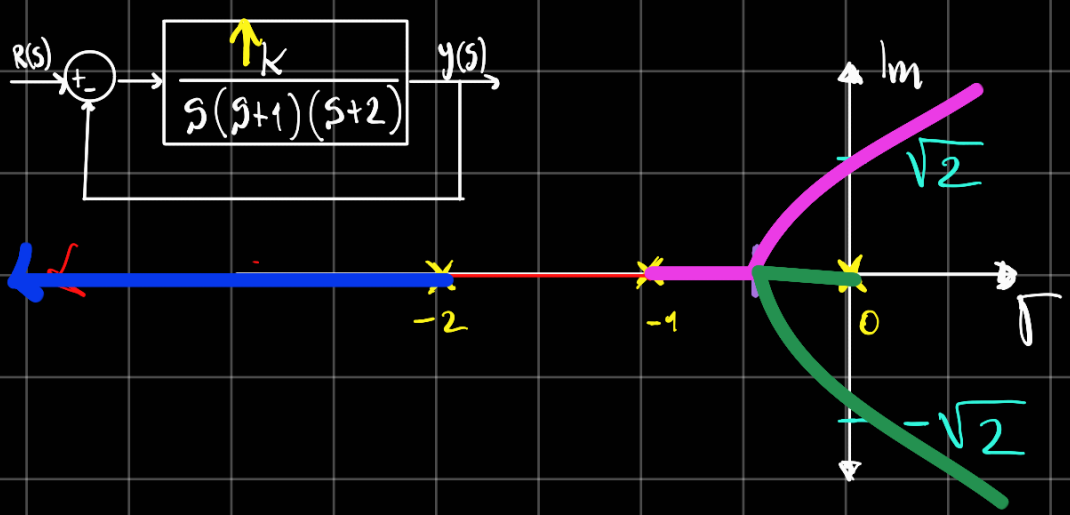
① $-3w^2 + K = 0$

② $2w - w^3 = 0 \rightarrow w(2 - w^2) = 0$

↳ $w = 0$

$w = \pm\sqrt{2}$

En la Ec. ①

$w = 0 \rightarrow K = 0$

$w = \pm\sqrt{2} \rightarrow K = 6$