Solucion ejercicio 2 segunda parte TP8-1.

Nyquist:

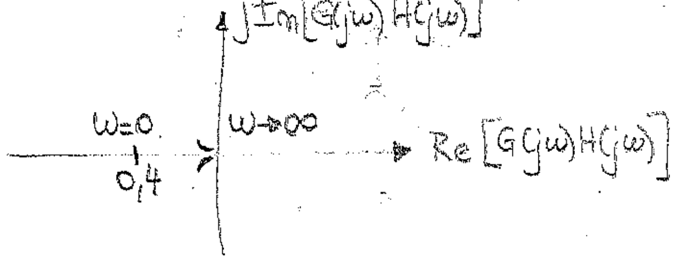
Análisis BF:

$$\lim_{s\to 0} G(s)H(s) = \lim_{s\to 0} \cancel{10}^{1} \frac{2}{(-1)\cdot 5 \cdot \cancel{10}_{1}} = \lim_{s\to 0} \frac{0{,}4}{(-1)} = -0{,}4 + j0$$

Análisis AF:

$$\lim_{s\to \infty} G(s)H(s) = \lim_{s\to\infty} 10 \frac{\cancel{s}^{1}}{\cancel{s}_{1}\cdot s \cdot s} = \lim_{s\to\infty} \frac{10}{s^2} \quad \text{con } s = j\omega$$

$$\lim_{\omega\to\infty} \frac{10}{(-\omega^2)} \to 0 \angle -180^\circ$$



$$G(s)H(s) = 10 \frac{s+2}{s^3+14s^2+35s-50}$$

$$G(j\omega)H(j\omega) = 10 \frac{2+j\omega}{-j\omega^3 - 14\omega^2 + j35\omega - 50} = 10 \frac{(2+j\omega)}{-(14\omega^2+50) + j(35\omega-\omega^3)}$$

$$G(j\omega)H(j\omega) = 10 \frac{(2+j\omega)\left[-(14\omega^2+50) - j(35\omega-\omega^3)\right]}{\left[-(14\omega^2+50)\right]^2 + \left[(35\omega-\omega^3)\right]^2} =$$

$$G(j\omega)H(j\omega) = 10 \frac{-2(14\omega^2+50) + \omega(35\omega-\omega^3) + j\left[-\omega(14\omega^2+50) - 2(35\omega-\omega^3)\right]}{\left[-(14\omega^2+50)\right]^2 + \left[(35\omega-\omega^3)\right]^2}$$

$$G(j\omega)H(j\omega) = 10 \frac{-28\omega^2 - 100 + 35\omega^2 - \omega^4 + j(-14\omega^3 - 50\omega - 70\omega + 2\omega^3)}{\left[-(14\omega^2+50)\right]^2 + \left[(35\omega-\omega^3)\right]^2}$$

$$G(j\omega)H(j\omega) = 10 \frac{-\omega^4 + 7\omega^2 - 100 + j(-12\omega^3 - 120\omega)}{\left[-(14\omega^2+50)\right]^2 + \left[(35\omega-\omega^3)\right]^2}$$

$-\omega^4+7\omega^2-100=0$ con $\alpha=\omega^2$

$-\alpha^2+7\alpha-100=0$; $\alpha^2-7\alpha+100=0$

$\alpha_{1-2}=\dfrac{7\pm\sqrt{49-400}}{2}=3,5\pm j9,36$

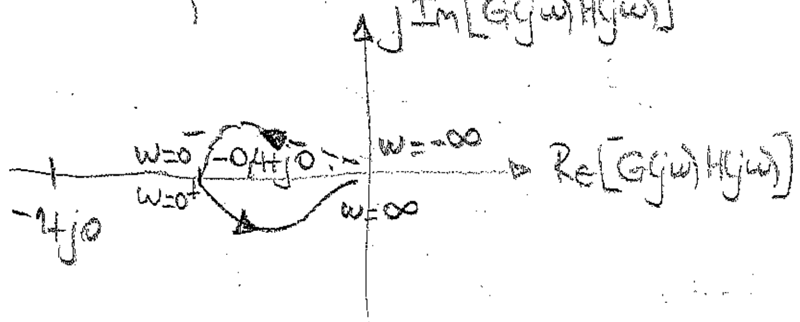
$-12\omega^3-120\omega=0$

$-\omega^2-10=0$

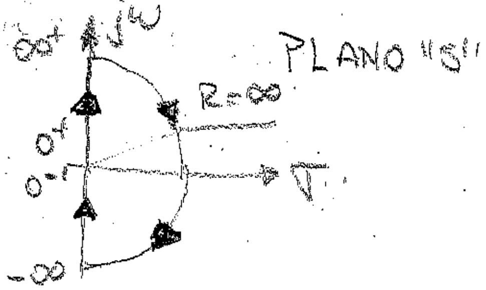
$\omega^2=-10$

$\omega_{1-2}=\pm\sqrt{-10}$

No hay cruces a ejes. Siempre la función tiene parte real e imaginaria negativa.



El contorno de Nyquist es:



Análisis AF. $s=\rho e^{j\theta}$

$$\lim_{\rho\to\infty}\frac{10}{\rho^2 e^{j2\theta}}\to 0\, e^{-j2\theta}$$

No hay rodeos. $N=Z-P=0$. como $P=1$ (polo en +1)

$Z=N+P=0+1=1$ es inestable