

# CMC-12: Lista 9

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Q1  $G(s) = \frac{10(s-1)}{(s+2)(s+3)} = \frac{10(s-1)}{s^2 + 5s + 6}$

$$G(j\omega) = \frac{10(j\omega - 1)}{-\omega^2 + 6 + 5j\omega} = \frac{10 \cdot 1(\omega^2 + 1)}{6(\omega^2 - 1) + j(\omega^3 - 11\omega)}$$

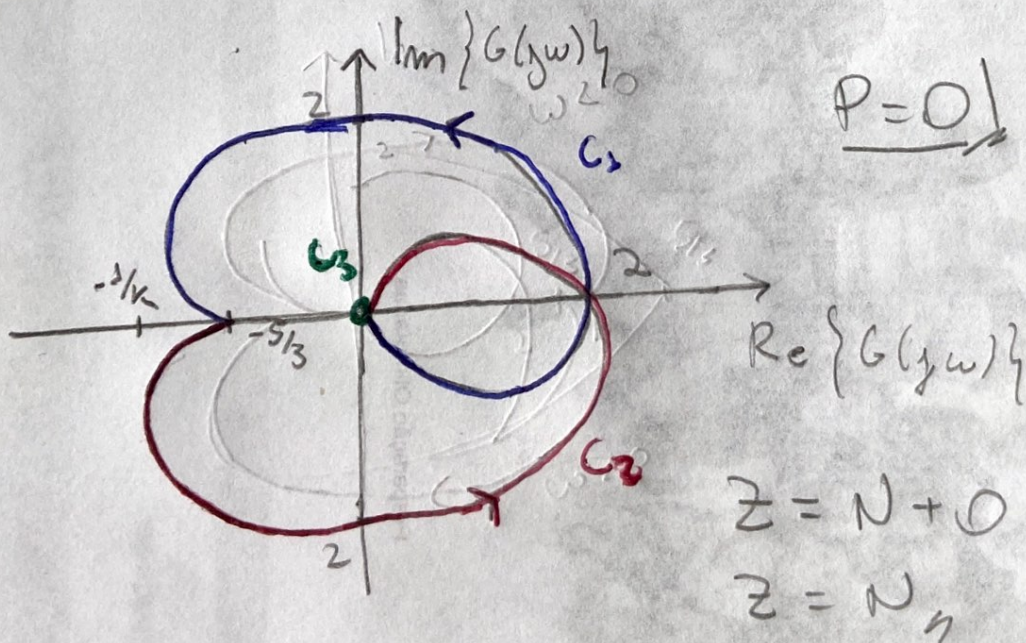
Cruzamentos:

$$\rightarrow \operatorname{Re}\{G\} = 0 \rightarrow \omega = 1 \rightarrow G(j\omega)|_{\omega=1} = -2j$$

$$\rightarrow \operatorname{Im}\{G\} = 0 \rightarrow \omega = \sqrt{11} \rightarrow G(j\omega)|_{\omega=\sqrt{11}} = 2$$

$$\bullet \omega = 0: |G(j\omega)| = \frac{5}{3} \text{ e } \angle G(j\omega) = 180^\circ$$

$$\bullet \omega \rightarrow \infty: |G(j\omega)| = 0 \text{ e } \angle G(j\omega) = -180^\circ$$



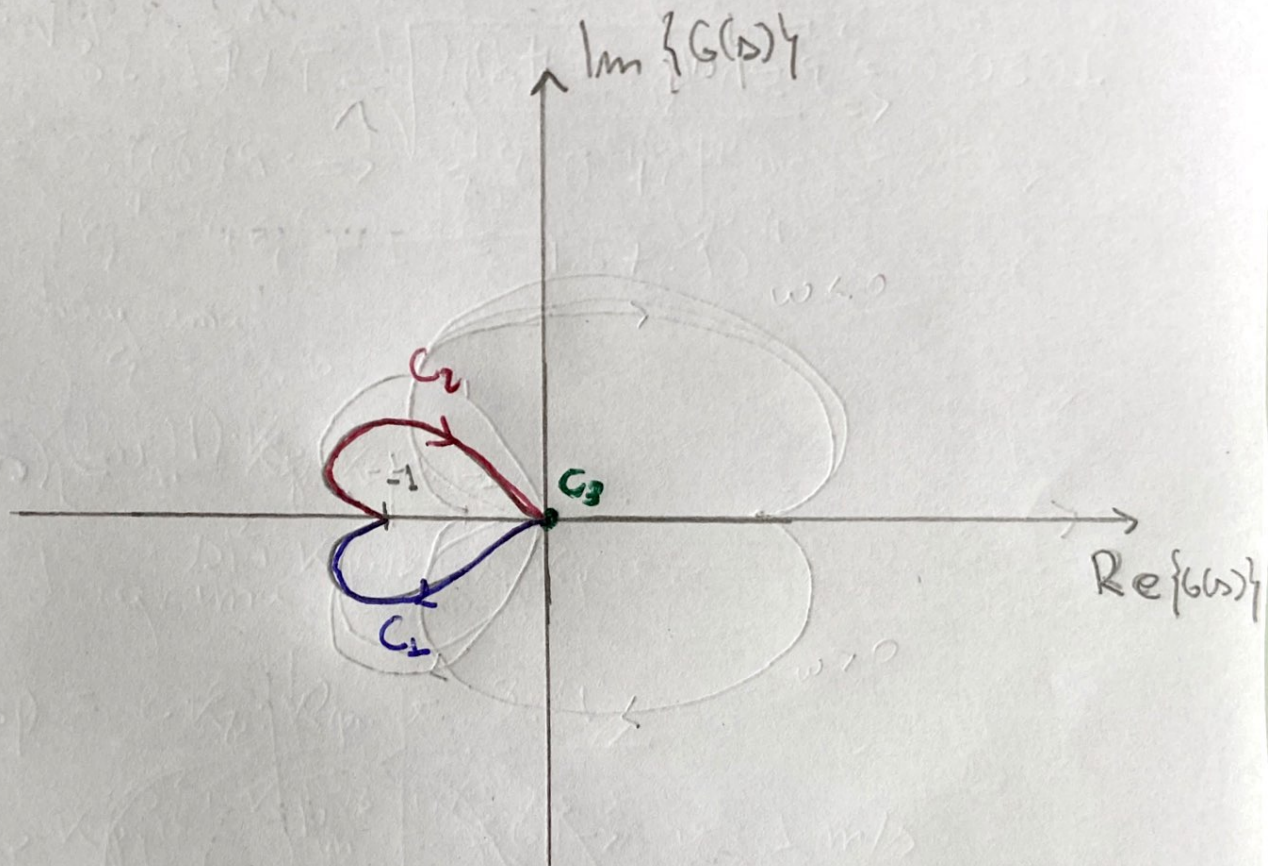
$$\text{Para } N=0, -\frac{1}{K} \leq -\frac{5}{3} \Rightarrow \frac{1}{K} \geq \frac{5}{3}$$

$$\Rightarrow K \leq \frac{3}{5} = 0,6$$



Q2  $G(s) = \frac{10}{(s+5)(s-2)} \rightarrow G(j\omega) = \frac{10}{- \omega^2 - 10 + 3\omega j}$

- $\omega = 0 : |G(j\omega)| = 1$  e  $\angle G(j\omega) = 180^\circ$
- $\omega \rightarrow \infty : |G(j\omega)| = 0$  e  $\angle G(j\omega) = -180^\circ$



→ Cruzamentos:

- $\text{Re}\{G(j\omega)\} = 0 \rightarrow -\omega^2 - 10 = 0 \rightarrow \nexists \omega$
- $\text{Im}\{G(j\omega)\} = 0 \rightarrow 3\omega = 0 \rightarrow \omega = 0 \rightarrow G(j\omega)|_{\omega=0} = -1$