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Modelagem de Sistemas Dinâmicos  
PMÉ 3380

$$\textcircled{1} G_{11}(s) = \frac{s^2 + 5s + 25}{s^4 + 7,4s^2 + 76s + 320} = \frac{25 \left( 1 - \left( \frac{\omega}{s} \right)^2 + \left( \frac{\omega}{s} \right) 5 \right)}{s \cdot s \cdot \left( \frac{\omega}{s} + 1 \right) \cdot 64 \cdot \left( 1 - \frac{\omega^2}{8^2} + 0,09 + \omega 5 \right)}$$

Constante de Bode =  $\frac{5}{64}$  ;  $20 \log \left( \frac{1}{64} \right) = -22,1 \text{ dB}$

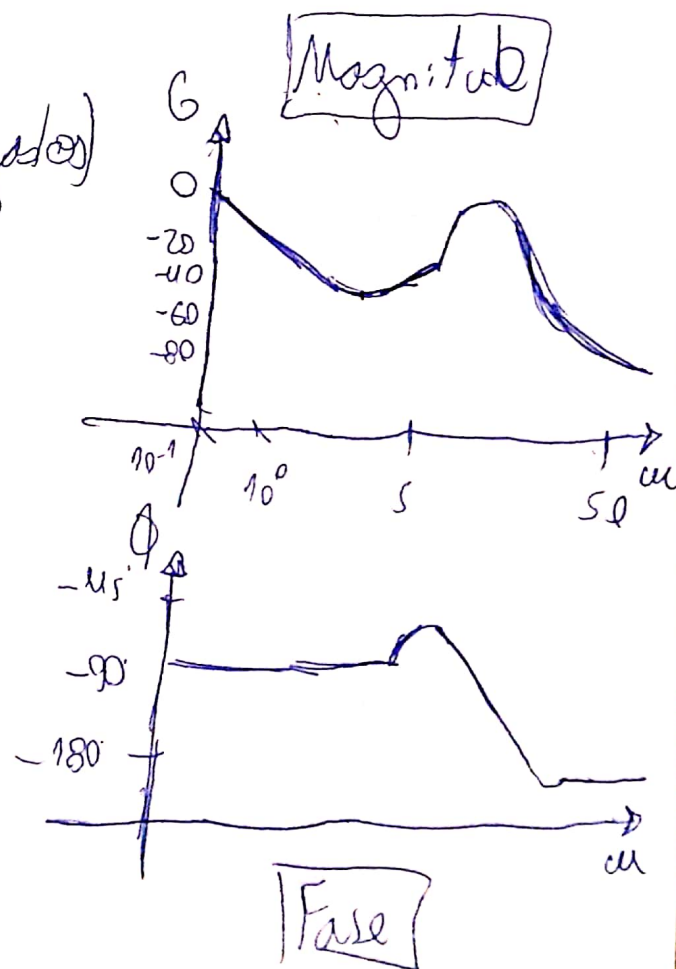
$\omega_m = 5 \text{ rad/s}$  (Zeros complexos conjugados)

$\omega_{\pi_2} = \omega_m \cdot \sqrt{1 - 2\zeta^2} = 3,5 \text{ rad/s}$  (Pico)

$\eta_{\pi_2} = \frac{1}{2 \zeta \sqrt{1 - 2\zeta^2}} = 1,25 \text{ dB}$  (Pico)

$\omega_{\pi p} = \omega_m \cdot \sqrt{1 - 2\zeta^2} = 7,8 \text{ rad/s}$

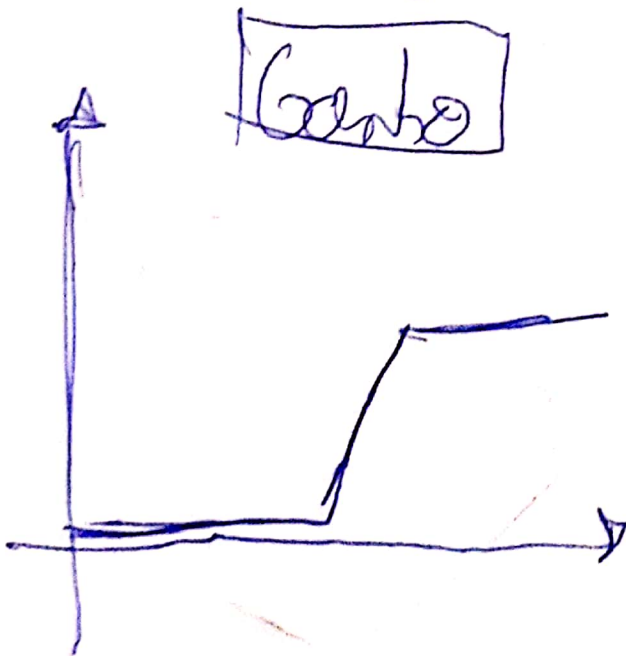
$\frac{1}{s} \rightarrow$  decaimento de 20 dB  
 $\frac{1}{s} \rightarrow$  início de fase -90°



$$\textcircled{2} \quad G_2(s) = \frac{G(s+2)}{s+12} \rightarrow G_2(j\omega) = \frac{1 \cdot \left( \frac{j\omega}{2} + 1 \right)}{\left( \frac{j\omega}{12} + 1 \right)}$$

$\omega_{rip} = 12 \text{ rad/s}$  (Pole)

Fase após  $12 \text{ rad/s}$



$\omega_{\pi_2} = 2 \text{ rad/s}$  (Zero)

Fase após  $2 \text{ rad/s}$

