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1)

$$G_1(s) = \frac{s^2 + 5 \cdot s + 25}{s(s^3 + 7{,}4\,s^2 + 76\,s + 320)}$$

$$G_1(j\omega) = \frac{25\left[1 - \left(\frac{\omega}{5}\right)^2 + \frac{\omega}{5}j\right]}{5 \cdot s\left(\frac{\omega j}{5} + 1\right) \cdot 64 \cdot \left[1 - \left(\frac{\omega}{8}\right)^2 + 0{,}0375\,\omega j\right]}$$

cte de Bode: $\frac{25}{5 \cdot 64} = \frac{5}{64}$; $20 \log\left(\left|\frac{5}{64}\right|\right) = -22{,}14\ dB$

↝ Zeros complexos conjugados com $\omega_n = 5$ rad/s

$$f_z = \frac{\omega_n}{25} = 0{,}5$$

Pico em $\omega_{r_2} = \omega_n \sqrt{1 - 2\zeta} = 3{,}5$ rad/s

Pico de $M_{r_2} = \frac{1}{2\zeta\sqrt{1-2\zeta}} = 1{,}25\ dB$

P/ $\omega >> \omega_{n2}$, 40dB por década

Termo Integrador $1/s$: Decaimento de 20dB/década

Par de polos complexos conjugados:

$\omega_n = \zeta$ rad/s ; $\zeta = 0{,}15$

$\omega_{r_p} = \omega_n \sqrt{1 - 2\zeta} = 7{,}8$ rad/s

$M_{dB} = 20 \log\left(2\zeta\sqrt{1-\zeta^2} - 1\right) = 10{,}55\ dB$

P/ $\omega >> \omega_{rp}$ → Queda de 40dB