

3 e)

$$G(s) = \frac{2s+5}{s^2+2s+5}$$

$$R(s) \rightarrow \boxed{G(s)} \rightarrow Y(s)$$

$$R(s) = \frac{1}{s}$$

$$R(t) = 1(t); t \geq 0$$

$$\begin{aligned} K &\Rightarrow \frac{2(\frac{5}{2}+1) \cdot \frac{5}{2}}{(\frac{s^2}{5} + \frac{2}{5}s + 1) \cdot 5} \\ &= \frac{2 \cdot \frac{5}{2} (\frac{2}{5}s + 1)}{5(1 + \frac{s^2}{5} + \frac{2s}{5})} \\ &= \frac{\frac{10}{2}}{5} \cdot \frac{(\frac{5}{2}s + 1)}{(\frac{1}{5}s^2 + \frac{2}{5}s + 1)} \end{aligned}$$

$$K=1$$

$$\boxed{0 < \xi < 1}$$

$$\boxed{K=1}$$

$$\omega_n \approx 2,236 \text{ rad/sec}$$

$$\xi = 0,4472$$

Subamortecido

$$P_1 = -1 + 2i$$

$$P_2 = -1 - 2i$$

$$M_p = 0,2078$$

$$t_p = 1,570 \text{ sec}$$

$$t_s = 4 \text{ sec}$$

$$\omega_d = 2 \text{ rad/sec}$$

$$t_r = 1,01722 \text{ sec}$$

$$Y(s) = \frac{1}{s} \cdot \frac{2s+5}{s^2+2s+5} = \frac{2s+5}{s(s^2+2s+5)}$$

$$= \frac{2}{s(s^2+2s+5)} + \frac{5}{s(s^2+2s+5)}$$

$$= \frac{2}{(s+1+2i)(s+1-2i)} + \frac{5}{s(s+1+2i)(s+1-2i)}$$

$$A = \frac{2}{(s+1+2i)(s+1-2i)} \Big|_{s=-1-2i} = \frac{2}{-1-2i+1-2i} = \frac{2}{-4i} = -\frac{2i}{4}$$

$$B = \frac{2}{(s+1+2i)(s+1-2i)} \cdot (s+1-2i) \Big|_{s=-1+2i} = \frac{2}{-1+2i+1+2i} = \frac{2}{4i} = \frac{2i}{4}$$

$$\frac{\frac{2i}{4}}{s+1+2i} - \frac{\frac{2i}{4}}{s+1-2i} + \dots$$

try to finish

$$\frac{\frac{2i}{4} [s+1-2i]}{(s+1)^2 - (2i)^2} - \frac{\frac{2i}{4} [s+1+2i]}{(s+1)^2 - (2i)^2}$$

3 e)

$$G(s) = \frac{2s+5}{s^2+2s+5}$$

=> FTMF

$$R(s) = \frac{1}{s}$$

$$2s+5=0 \Rightarrow s = -\frac{5}{2}$$

Zeros $z = -2,5$

$$s^2+2s+5=0 \Rightarrow s = -1 \pm 2j$$

Poles $-1+2j, -1-2j$

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$$\frac{2s+5}{s^2+2s+5} \cdot \frac{1}{s}$$

$$= \frac{1}{s} \left[\frac{2s}{s^2+2s+5} + \frac{5}{s^2+2s+5} \right]$$

$$= \frac{2}{s^2+2s+5} + \frac{5}{s(s^2+2s+5)}$$

$$s^2+2s+5 \rightarrow \omega_n = 2,236$$

$\xi = 0,447$

$$\left\{ \begin{array}{l} p_1, p_2 = -1 \pm 2j \\ M_p = 0,207879 \\ t_p = 1,57 \text{ seg} \\ y(t_p) = 1,20 \\ t_s = 4 \text{ sec} \\ \omega_d = 2 \\ t_r \approx 0,778 \\ \text{Dois polos complexos} \\ \text{subamortecido} \\ \xi = 0,447 \end{array} \right.$$

$$\left\{ \begin{array}{l} (s+1+2j)(s+1-2j) \\ s^2 + \cancel{s} - 2j\cancel{s} + s + 1 - 4j^2 + \cancel{2s} \\ = s^2 + 2s + 5 \end{array} \right.$$