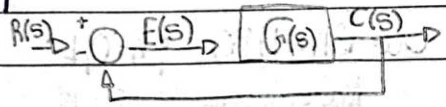
Lista 4 Daniel Augusto Müller

* Gráficos no final

1)



$K = 0, 1, 2$

a) $G(s) = \dfrac{K(s+1)}{s^2(s+3{,}6)}$ $\theta_a = \dfrac{(2K+1).180}{N_{polos} - N_{zeros}} = \dfrac{(2K+1).180}{3-1} = \pm 90°$

$$\sigma_a = \frac{\sum polos - \sum zeros}{N_{polos} - N_{zeros}} = \frac{(-3{,}6+0+0) - (-1)}{3-1} = \frac{-2{,}6}{2} = -1{,}3$$

b) $G(s) = \dfrac{K}{s(s^2+4s+5)}$ $\sigma_a = \dfrac{[0+(-2+i)+(-2-i)] - 0}{3-0} = -\dfrac{4}{3}$

$\theta_a = \dfrac{(2K+1).180}{3-0}$; $K = 0, 1, 2$

$\theta_a = \pm 60°, 180°$

$0 = \dfrac{1}{\sigma} + \dfrac{1}{\sigma-2+i} + \dfrac{1}{\sigma+2+i}$

$\sigma_1 = -1{,}67$

$\sigma_2 = -1$

$$T(S) = \frac{K}{S^3+4S^2+5S+K}$$

$$\frac{20-K}{4} = 0 \rightarrow \boxed{K=20}$$

S^3	1	5
		K
$S^2 - \begin{vmatrix} 1 & 5 \\ 4 & K \end{vmatrix} \Big/ 4 = \frac{20-K}{4}$		0
$S^1 - \begin{vmatrix} 4 & K \\ \frac{20-K}{4} & 0 \end{vmatrix}$ / $\frac{20-K}{4}$		0

$$4S^2+20=0$$

$$\boxed{S = \pm\sqrt{5}\,i}$$

Ângulo de Partida

$$\sum \theta_{zeros} - \sum \theta_{polos} = 180°$$

$$-(\theta_2 + 90° + 153{,}43°) = 180°$$

$$\theta_2 = 423{,}43° = -63{,}43°$$

2) $K.G(S).H(S) = \frac{10K}{S(S+2)}$

$$\sigma a = \frac{\sum polos - \sum zeros}{N polos - N zeros} = \frac{(0-2)-0}{2-0} = -1$$

$$\theta a = \frac{(2K+1)180}{Npolos - Nzeros} \; ; K = 0, 1$$

$$\theta a = (2K+1)90$$

$$\theta a = \pm 90°$$

$$0 = \frac{1}{\sigma} + \frac{1}{\sigma+2} \rightarrow \sigma = -1$$

3) a) $G(S) = \frac{K(S^2-2S+2)}{(S+2)(S+4)(S+5)(S+6)}$

$$\sigma a = \frac{[(-2-4-5-6)-(1+1)]}{4-2} = -\frac{19}{2}$$

$S^2-2S+2=0$

$$S = \frac{2 \pm \sqrt{4-4.1.2}}{2} = \frac{2 \pm 2i}{2} = 1 \pm i$$

$$\theta a = \frac{(2K+1)180}{NPolos - Nzeros} = (2K+1)90 \; ; K = 0,1,2,3$$

$$\theta a = \pm 90$$

$$\sum_{1}^{m} \frac{1}{\sigma + pi} \rightarrow \frac{1}{\sigma-1+i} + \frac{1}{\sigma-1-i} = \frac{1}{\sigma+2} + \frac{1}{\sigma+4} + \frac{1}{\sigma+5} + \frac{1}{\sigma+6}$$

$$T(s) = \frac{K(s^2-2s+2)}{s^4+17s^3+s^2(K+104)-s(2K-268)+(2K+240)}$$

s^4	1	$K+104$	$2K+240$	0
s^3	17	$2K-268$	0	0
s^2	$\frac{19K-1500}{17}$	$2K+240$	0	
s^1	$\frac{38K^2-8670-29160}{19K-1500}$	0		
s^0	$2K+240$	0		

$$-\frac{\begin{vmatrix} 1 & K+104 \\ 17 & 2K-268 \end{vmatrix}}{17} = \frac{19K-1500}{17}$$

$$-\frac{\begin{vmatrix} 1 & 2K+240 \\ 17 & 0 \end{vmatrix}}{17} = 2K+240$$

$$-\frac{\begin{vmatrix} 17 & 2K-268 \\ \frac{19K-1500}{17} & 2K+240 \end{vmatrix}}{\frac{19K-1500}{17}} = \frac{-34K-4080+\frac{38}{17}K^2-\frac{5092}{17}K-\frac{2092}{17}K+\frac{40000}{17}}{\frac{19K-1500}{17}}$$

$$= \frac{\frac{38}{17}K^2-510K-\frac{29160}{17}}{\frac{19K-1500}{17}} = \frac{38K^2-8670-29160}{19K-1500}$$

Linha de zeros

$$34K+\frac{(2K-268)(19K+1500)}{17}+4080=0 \quad K=115,58$$

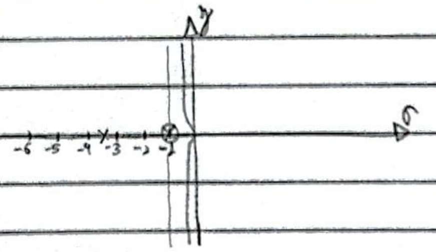
Linha acima da de zeros

$$s^2\left(\frac{19(115,58)+1500}{17}\right)+2(115,58)+240=0 \quad s=\pm 1,47i$$

$$\Theta_1+180+180+180+(172,87+172,87)=180^\circ \quad \boxed{\Theta_1=-16,25^\circ}$$

$$\Theta_2+11,3+9,46+11,3+18,43+(\Theta_2+90)=180 \quad \boxed{\Theta_2=137,30^\circ}$$

1) a)



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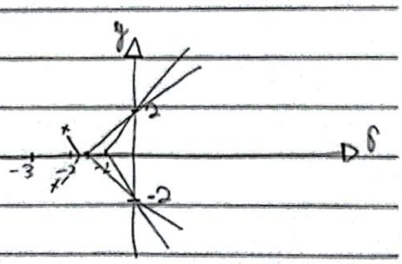

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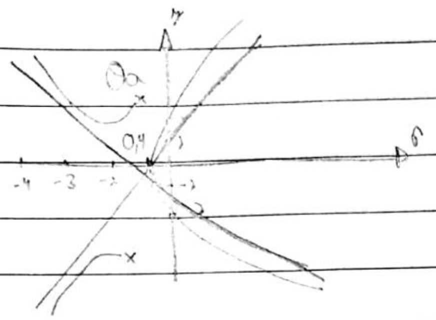

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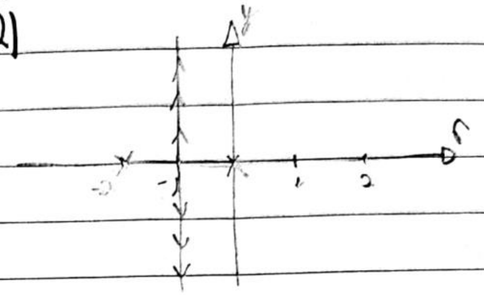
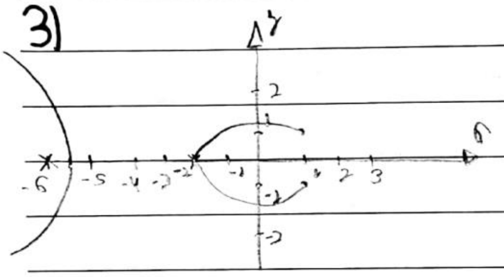


3)



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