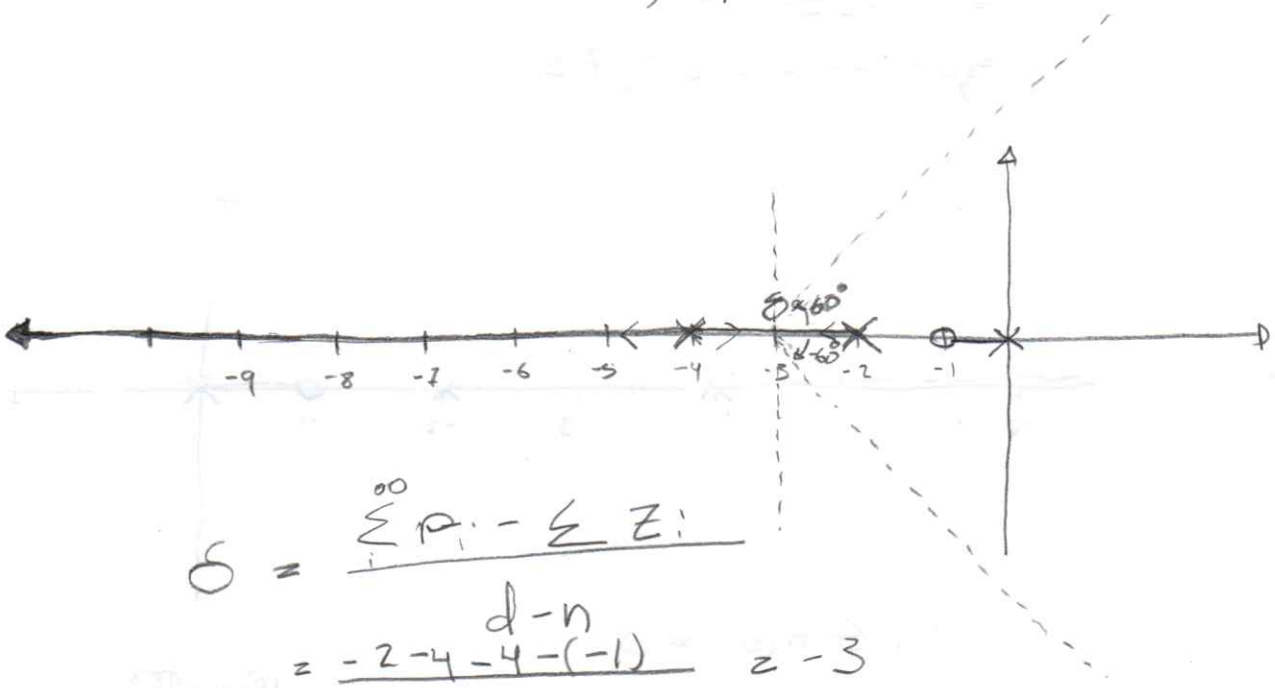
tesis OT 26/6/2009.

1d) $GH(s) = K\dfrac{s+1}{s(s+2)(s+4)^2} = -1$

Polos: $s=0$, $s=-2$, $s=-4;-4$; $d=4$ polos

Zeros: $s=-1$; $n=1$



$$\sigma = \frac{\sum p_i - \sum z_i}{d-n} = \frac{-2-4-4-(-1)}{3} = -3$$

$$\text{asíntotas} = \frac{(1+2b)}{d-n}\cdot 180^\circ$$

$b: 1, 2, 3 \ldots$

$$K = -\frac{s(s+2)(s+4)^2}{(s+1)} = -\frac{(s^2+2s)(s^2+4s+4s+4^2)}{s+1}$$

$$= -\frac{s^4+4s^3+4s^3+4^2s^2+2s^3+8s^2+8s+4^2 2.s}{s+1}$$

$$= \frac{s^4+10s^3+32s^2+32s}{s+1}$$

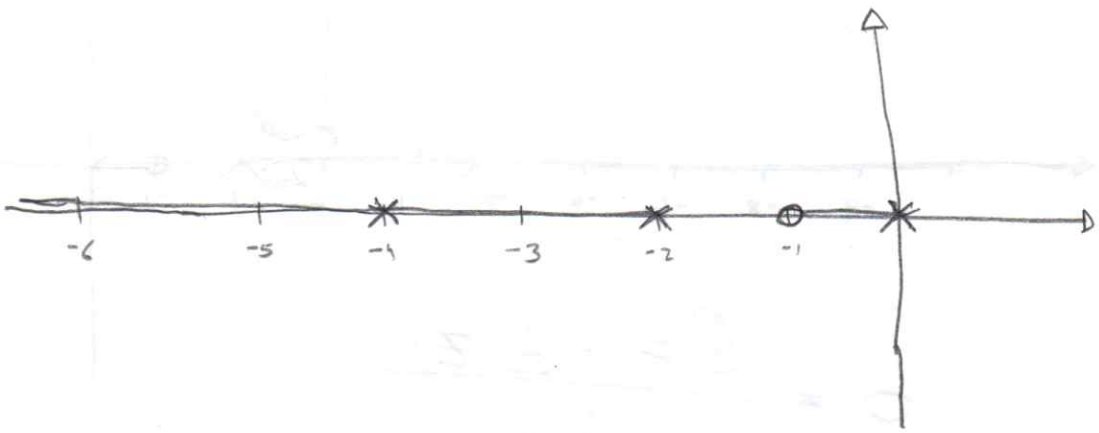
$$\frac{dK}{ds} = -\frac{(4s^3+30s^2+64s+32)(s+1) - s^4+10s^3+32s^2+32s}{(s+1)^2}$$

$$= -\frac{3s^4+24s^3+62s^2+64s+32}{(s+1)^2}$$

$s_1 = -4$

$s_2 = -2{,}54$

$s_{3,4} = -0{,}7 \pm j\,0{,}73$



$$1 + G\,H(s) = 0$$

receita

$$\frac{s(s+2)(s+4)^2 + K(s+1)}{s(s+2)(s+4)^2} = 0$$

$$s^4+10s^3+32s^2+32s+Ks+K = 0 \quad \Big| \; s = j\omega$$

$$\begin{cases} \omega^4 - 32\omega^2 + K = 0 \\ -10\omega^3 + (32+K)\omega = 0 \end{cases} \quad \begin{cases} K = 0 \\ \omega = 0 \;\vee\; \omega^2 = \dfrac{32+K}{10} \end{cases}$$

Re

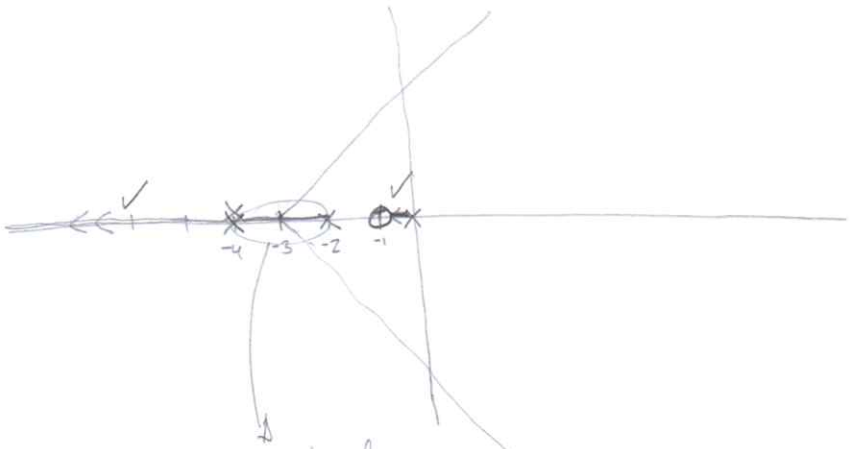
Im

tesis OT 26/6/2009

$k^2 - 156k - 9216 = 0 \rightarrow \begin{cases} k = 201{,}69 \\ k = -\cancel{95}{,}69 \end{cases}$

$w = \pm j\, 4{,}83.$

1 d)



centroid
e Angulo
cal€
4 branches
3 assymptotes
Angle 60°
180°
300°
$\sigma = -3$

Quebra $-3 < s < -2$

$\frac{dK}{ds} = 0$

intercepção eixo imaginario

$P(s) = \phi \mid s = j\omega$

$D(s) = s(s+2)(s+4)(s+4) + K(s+1)$

$= (s^2+2s)(s+4)(s+4) + K(s+1)$

$= (s^3+4s^2+2s^2+8s)(s+4) + K(s+1)$

$= (s^4+4s^3+2s^3+8s^2+4s^3+16s^2+8s^2+32s) + K(s+1)$

$= (s^4+10s^3+32s^2+32s) + K(s+1)$

$\therefore K = -\frac{(s^4+10s^3+32s^2+32s)}{(s+1)}$

$\frac{dK}{ds} = \frac{(4s^3+30s^2+64s+32)(s+1) - (s^4+10s^3+32s^2+32s)}{(s+1)}$

$\phi = (4s^4+30s^3+64s^2+32s+4s^3+30s^2+64s+32) - \ldots$

$= (4s^4+34s^3+94s^2+96s+32) - (s^4+10s^3+32s^2+32s)$

$= 3s^4+24s^3+62s^2+64s+32$

calculador EQUA.

$x_1 = -2{,}599$
$x_2 = -4$
$x_3 = 1m$
$x_4 = 1m$

quebra $-3 < s < -2$

$\therefore s = -2{,}599$

$\tilde{=} -2{,}6$