3) $\dfrac{k(S(S-1))}{(S+2)(S+3)(S^2+2S+2)}$

$Z = +1, 0$

$P = (-2, -3)(-1 \pm 1i)$
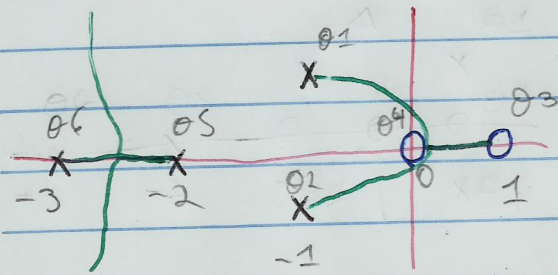
$\sigma_0 = \dfrac{(-2-3+1)(0+1)}{4-2} = \dfrac{-8}{2} = -4$ //

$\gamma_0 = \dfrac{180}{2} = 90°$

Derivada *

$-2x^5 - 4x^4 + 14x^3 + 40x^2 + 24x - 12 = 0 \Rightarrow$
$$\left. \begin{array}{c} -2,52 \\ 0,31 \\ 2,97 \end{array} \right.$$

ang $\dfrac{z}{\theta}$,

$-\theta_1 - 90° + \boxed{Tan^{-1}\left(\dfrac{1}{2}\right)} + \boxed{tan^{-1}\left(\dfrac{1}{1}\right)} - \boxed{Tan^{-1}\left(\dfrac{1}{3}\right)} - \boxed{tan^{-1}\left(\dfrac{1}{2}\right)} = 180$

$-\theta_1 - 90 + 153,43 + 135° - 45° - 26,57 = 180$

$-\theta_1 = -53, 14$

$*$ $$\frac{S(S-1)}{(S+2)(S+3)(S^2+2S+2)}$$

$$= \frac{d}{dS}\left(S(S-1)\right)(S+2)(S+3)(S^2+2S+1) - \frac{d}{dS}\left((S+2)(S+3)(S^2+2S+2)\right) \cdot$$

$$\to \frac{S(S-1)}{\left((S+2)(S+3)(S^2+2S+2)\right)^2}$$

$\downarrow$

$$= \frac{(2S-1)(S+2)(S+3)(S^2+2S+2) - (4S^3+21S^2+36S+22)S(S-1)}{\left((S+2)(S+3)(S^2+2S+2)\right)^2}$$

$$= \frac{-2S^5 - 4S^2 + 14S^3 + 40S^2 + 24S - 12}{(S+2)^2(S+3)^2(S^2+2S+2)^2}$$

$$\frac{K(S(S-1)}{(S+2)(S+3)(S^2+2S+2)} \implies \frac{K(S(S-1)}{(S+2)(S+3)(S^2+2S+2)+K(S(S-1)}$$

$$S^4 + 7S^3 + 18S^2 + 22S + 12 + KS^2 - KS$$

$$S^4 + 7S^3 + (18+K)S^2 + (22-K)S + 12$$

S^4	1	18+K	12
S^3	7	22-K	0
S^2	$\frac{8K+104}{7}$	12	$\circledcirc$
S^1	$\frac{-2k^2+18k+425}{2(k+13)}$	$\circledcirc$	$\circledcirc$
S^0	12	0	0

$$-\frac{\begin{vmatrix} 1 & 18+k \\ 7 & 22-k \end{vmatrix}}{7} = \frac{+8k+104}{7}$$

$$-\frac{\begin{vmatrix} 1 & 12 \\ 7 & 0 \end{vmatrix}}{7} = \frac{-84}{7} = -12$$

$$\frac{\begin{vmatrix} 7 & 22-k \\ \frac{8k+104}{7} & 12 \end{vmatrix}}{\frac{8k+104}{7}} = \frac{\frac{-8k^2+72k+1700}{7}}{\frac{8k+104}{7}}$$

$$\frac{-2k^2+18k+425}{2(k+13)} = 0$$

$$\downarrow$$

$$J\omega = \left(\frac{8K+104}{7}\right)S^2 + 12 = 0$$

$$\frac{8 \cdot 19,756 + 104}{7}S^2 + 12 = 0$$

$$K_1 = \frac{-9+7\sqrt{19}}{2} = -10,756$$

$$K_2 = \frac{9+7\sqrt{19}}{2} = 19,756$$

$$\boxed{S = \pm 0,566}$$