Localización de polos y ceros

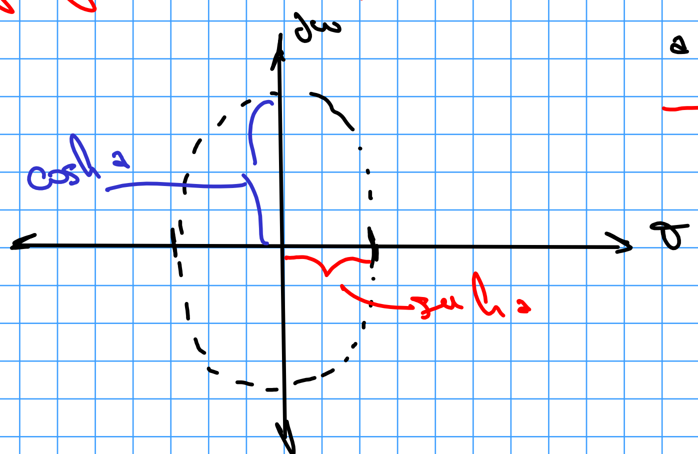
Sec. 7.3

$$|T(j\omega)|^2 = \frac{1}{1+C_n^2(\omega)}\bigg|_{\omega = \frac{s}{j}} = \frac{1}{1+C_n^2(s/j)} = T(s)\cdot T(-s)$$

- $C_n(s/j) = \varepsilon \cdot \cosh[n \cdot \cosh^{-1}(s/j)]$

$$\begin{cases} \sigma_k = \operatorname{senh} a \cos\left(\dfrac{2k-1}{2n}\pi\right) \\ \omega_k = \cosh a \cos\left(\dfrac{2k-1}{2n}\pi\right) \end{cases} \quad k = 1, 2, \ldots, n$$

- $\underbrace{\dfrac{\sigma_k^2}{\operatorname{senh}} + \dfrac{\omega_k^2}{\cosh}}_{\text{lugar geométrico elíptico}} = \operatorname{sen}^2(x) + \cos^2(x) = 1$



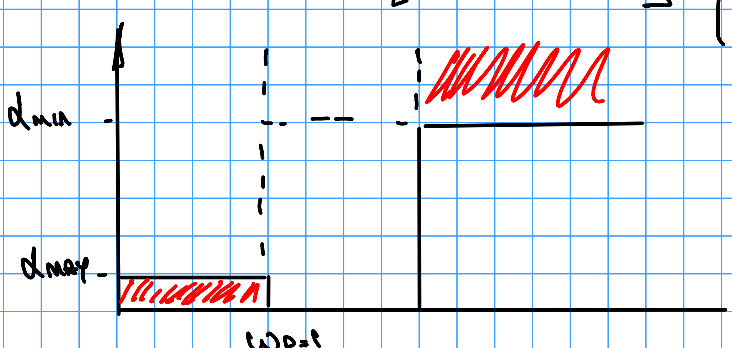
$$a = \frac{1}{n} \cdot \operatorname{senh}^{-1} \frac{1}{\varepsilon}$$

Métodos de diseño

$$|T(j\omega)|^2 = \frac{1}{1+C_n^2(\omega)}$$

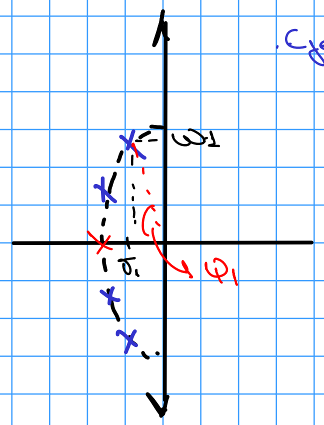
$$C_n(\omega) = \varepsilon \cdot \cosh[n \cdot \cosh^{-1}(\omega)]$$

- $\omega = 1$
- $\alpha_{max} = \dfrac{1}{|T|} = \sqrt{1+\varepsilon^2}$
- $\alpha_{max} = 10 \log(1+\varepsilon^2)$
- $\varepsilon^2 = 10^{\frac{\alpha_{max}}{10}} - 1$



- $\omega = \omega_s$
- $\alpha_{min} = 10 \log(1 + C_n^2(\omega))$
- $\alpha_{min} = 10 \log(1 + \varepsilon^2 \cosh^2[n \cdot \cosh^{-1}(\omega_s)])$
- Se recomienda iterar para encontrar n.

· Método de Schaumann



· Ejemplo de orden 5.

$$T_4(s) = \frac{\omega_{01}^2}{s^2 + s\,\frac{\omega_{01}}{Q} + \omega_{01}^2} \quad \cdots$$

$$\omega_{01}^2 = \sigma_1^2 + \omega_1^2$$

$$Q_1 = \frac{1}{2\cos\varphi_1}$$

· Método del curso

Se calculan los las singularidades directamente desde el polinomio.

$$|T_4(j\omega)|^2 = \left.\frac{1}{1 + C_4^2(\omega)}\right|_{\omega = s/j} = T(s)\,T(-s)$$