$$n \geq \frac{1}{2} \frac{\log k_1}{\log\left(\frac{\omega_1}{\omega_2}\right)}$$

Primjer:

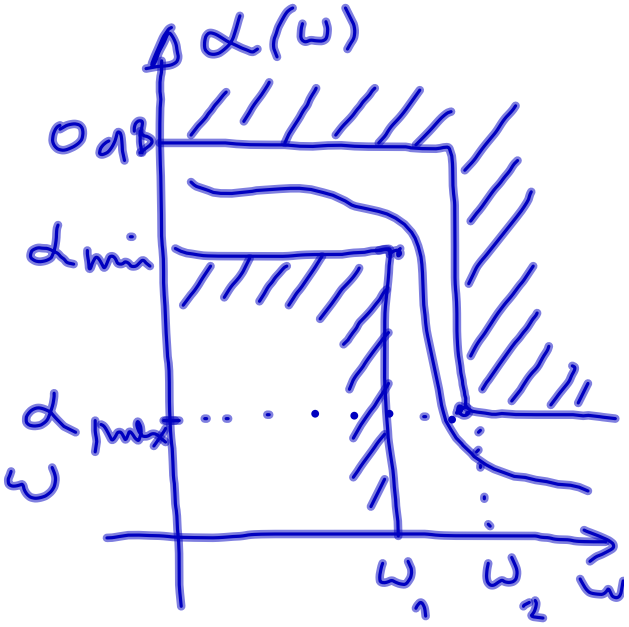
$\alpha_{min} = -0{,}1\ dB$

$\alpha_{max} = -30\ dB$

$\omega_1 = 0{,}1562$

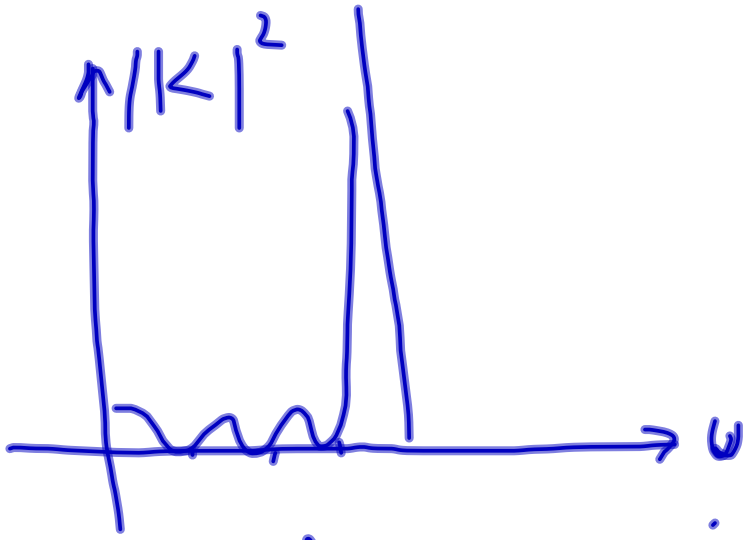
$\omega_2/\omega_1 = 1{,}3$

$n = 21$



$$2n \log\left(\frac{\omega_1}{\omega_2}\right) = \log\left(\frac{10^{-\frac{\alpha_{min}}{10}} - 1}{10^{-\frac{\alpha_{max}}{10}} - 1}\right)$$

K_1



Aproksimacija po Čebišev

$$|K(\omega)|^2 = \varepsilon^2 \cdot T_n^2(\omega) \quad 0 < \varepsilon < 1$$

$T_n(\omega) \rightarrow$ Polinom Čebišev n-tog reda

$$T_n(\omega) = \cos(n \cdot \phi)$$

$$\omega = \cos\phi$$

$$T_n(\omega) = \cos(n \cdot \arccos\omega) \quad (|\omega| \leq 1)$$

$n = 0 \quad T_0 = 1$

$n = 1 \quad T_1 = \omega$

$|\omega| > 1 \rightarrow$ iperbole

$T_n(\omega) = \mathrm{ch}(n \cdot \mathrm{Arch}\,\omega)$

Relazione formale

$$T_n(\omega) = 2\omega \cdot T_{n-1}(\omega) - T_{n-2}(\omega)$$

$T_0 = 1$

$T_1 = \omega$

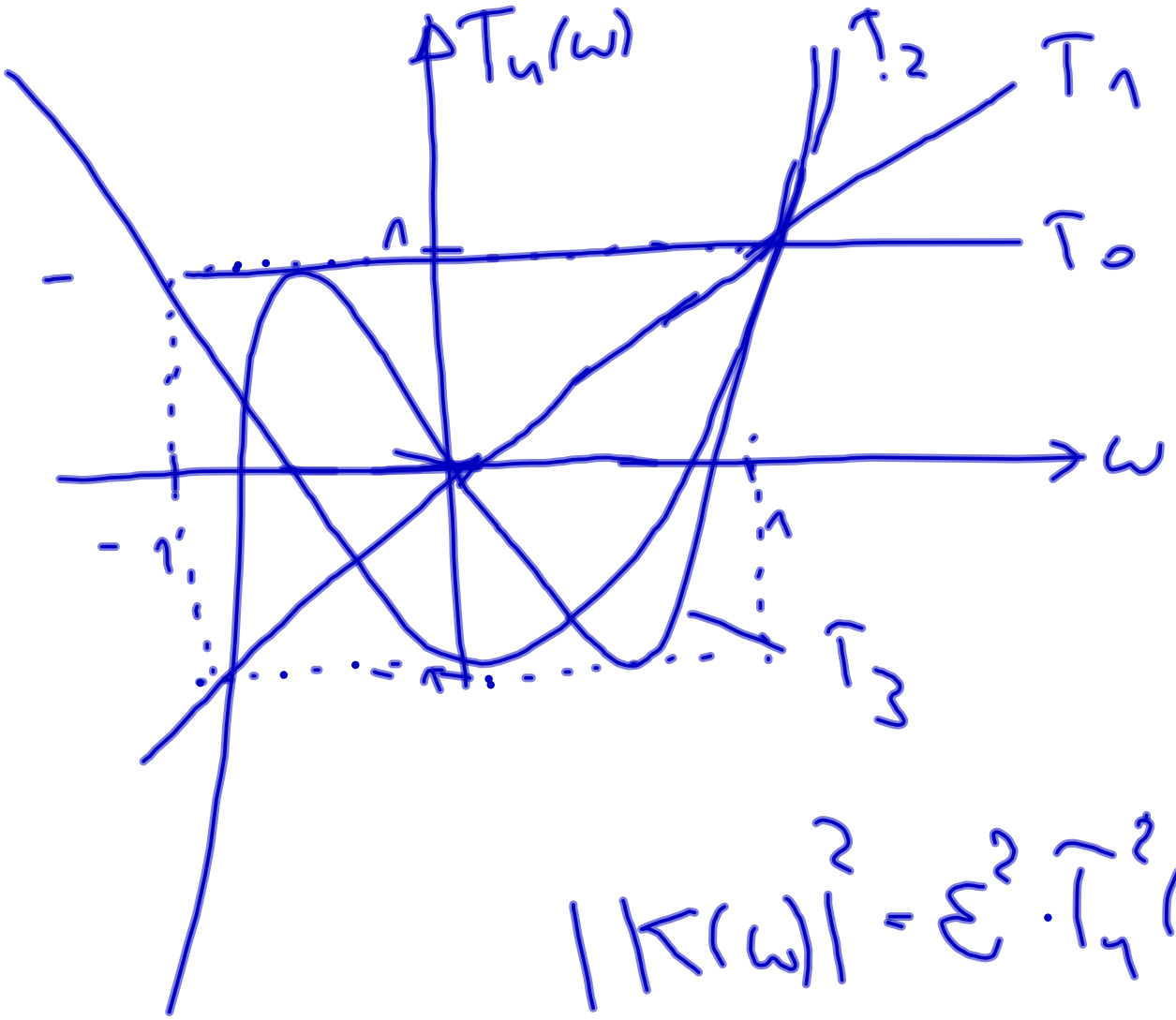
$T_2 = 2\omega^2 - 1$

$T_3 = 4\omega^3 - 3\omega$

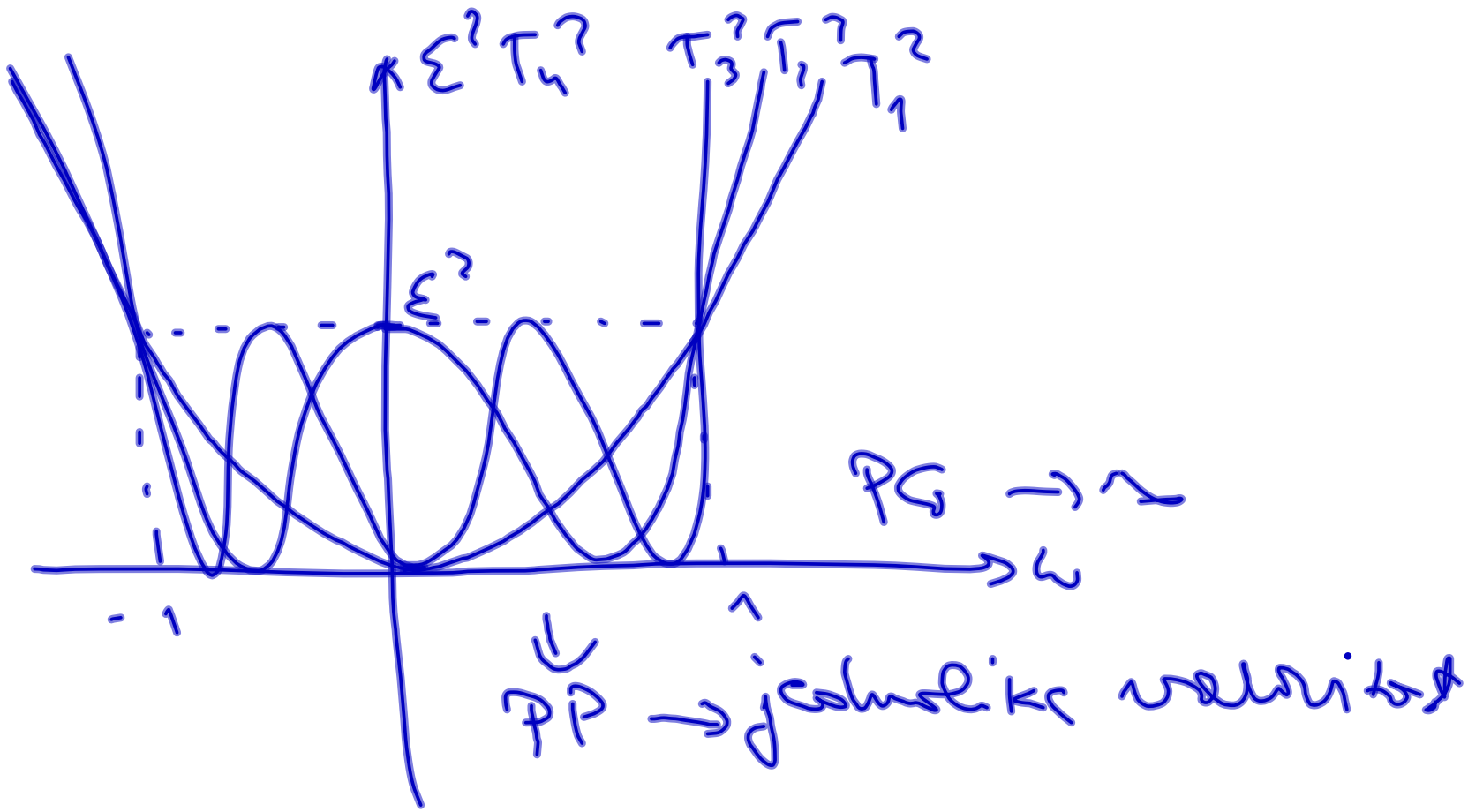
$T_4 = 8\omega^4 - 8\omega^2 + 1$

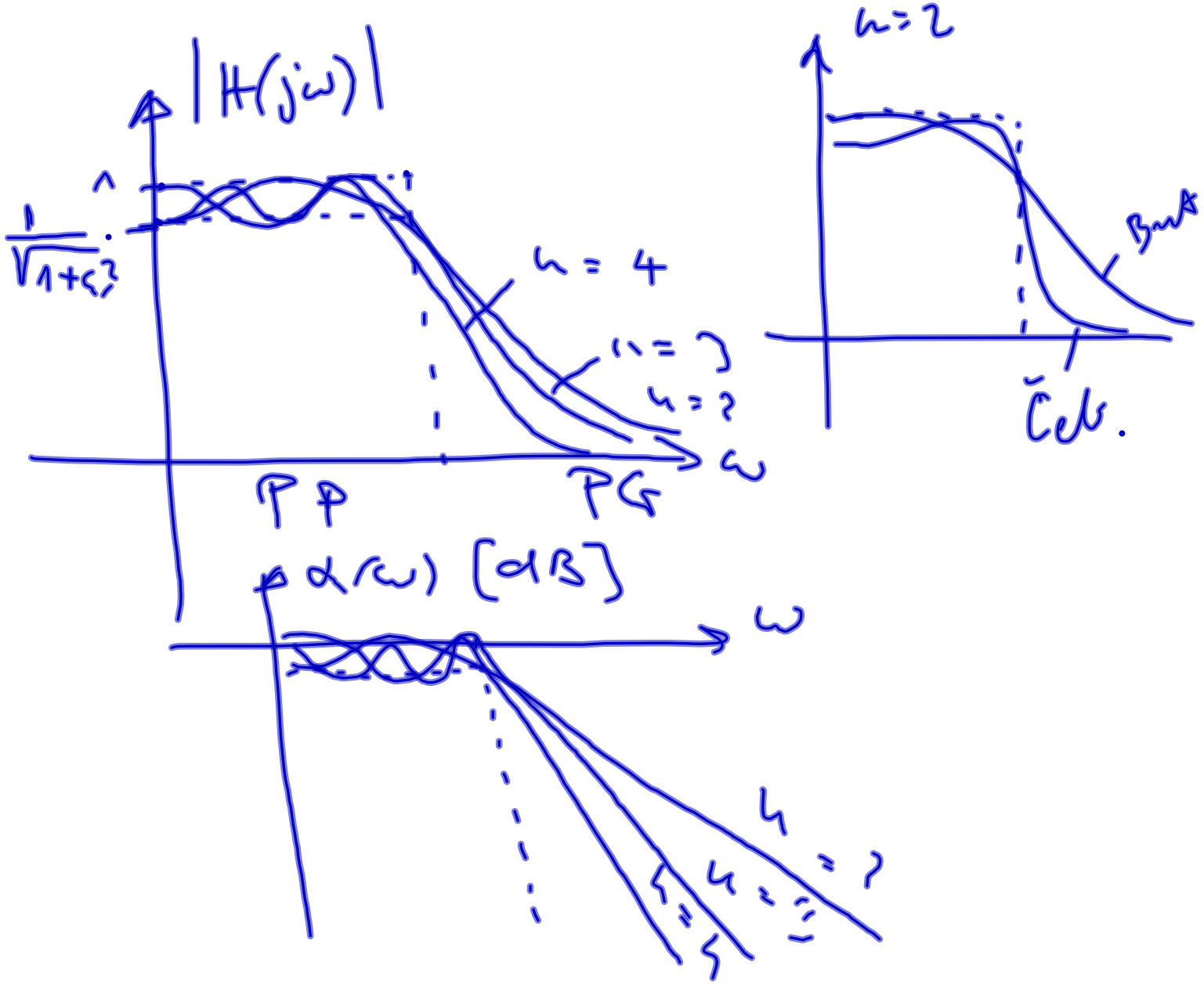
$T_5 = 16\omega^5 - 20\omega^3 + 5\omega$

$\vdots$



$$|K(\omega)|^2 = \varepsilon^2 \cdot \tilde{T}_4^2(\omega)$$

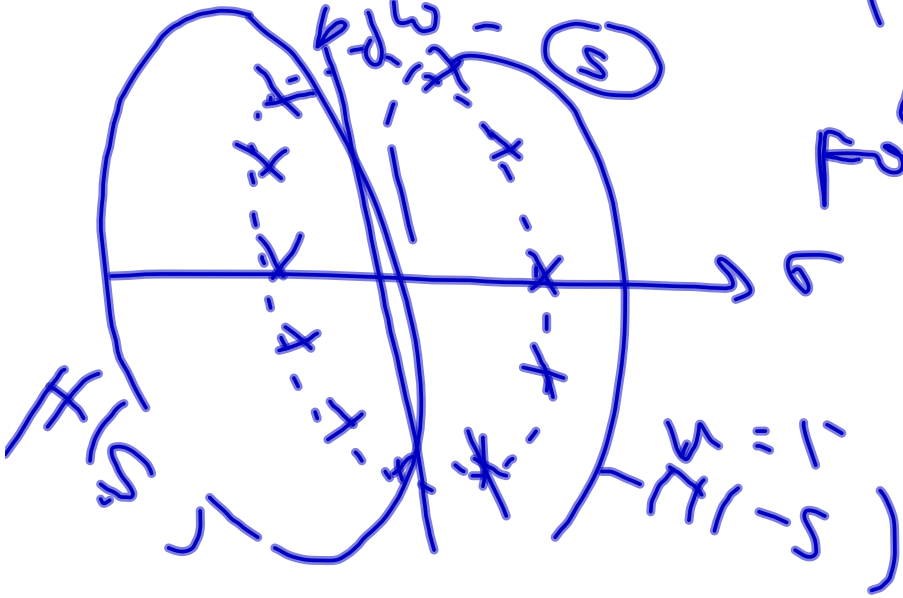

ξ^2 τ_4^2
τ_3^2 τ_2^2 τ_1^2
ξ^2
$\rho_G \to \infty$
ω
-1
1
$\rho_P \to$ jednolita wartość


|H(jω)|
1/√(1+ε²)
n = 4
n = 3
n = 2
ω
ωp
ωG
α(ω) [dB]
ω
n = 2
Butt
Cheb.

$$|H(j\omega)| = \frac{1}{\sqrt{1+\varepsilon^2 \cdot T_n^2(\omega)}}$$

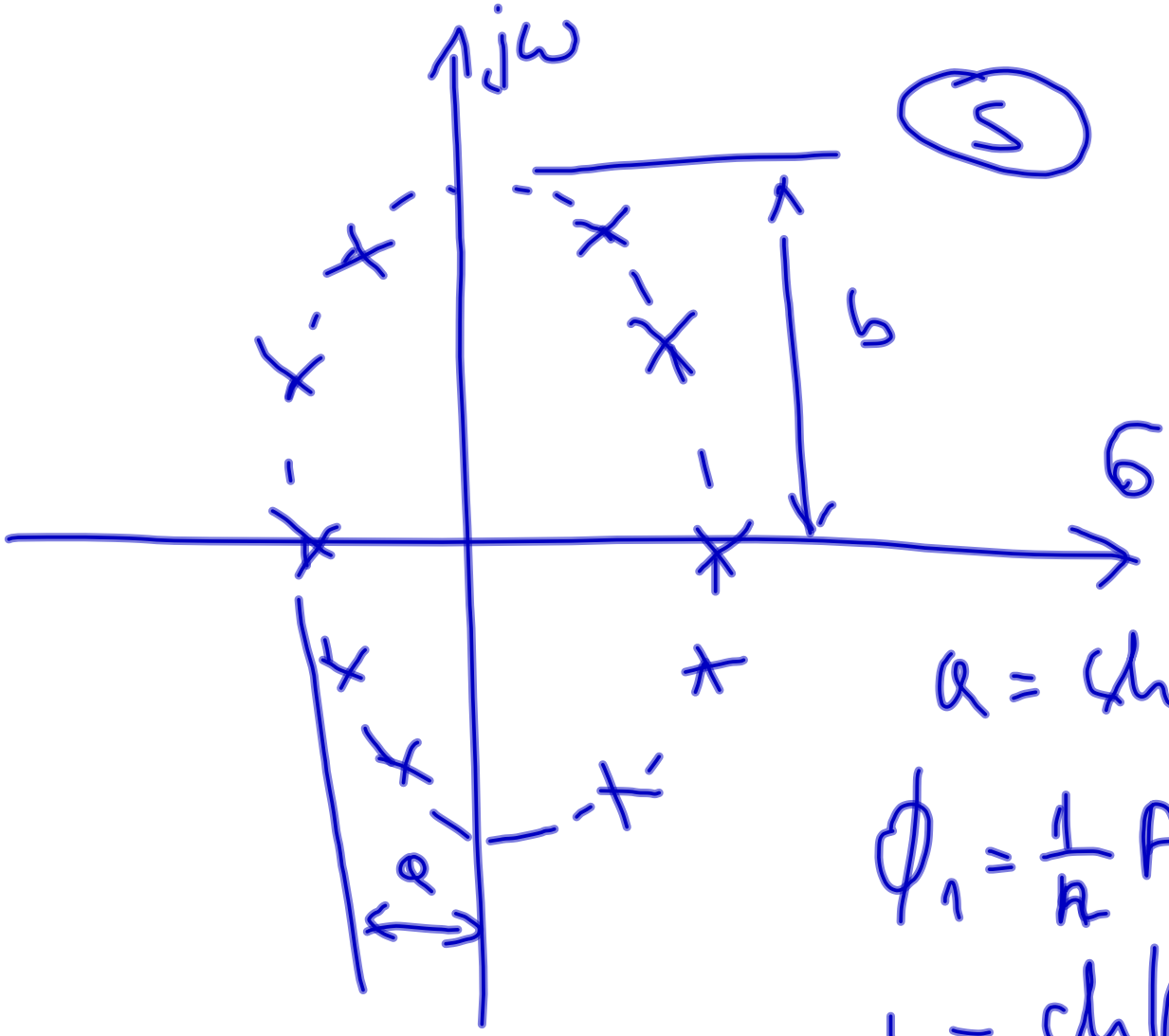
$H(s) = ?$

$$H(j\omega) \cdot H(-j\omega) = \frac{1}{1+\varepsilon^2 T_n^2(\omega)}$$



Forsom.

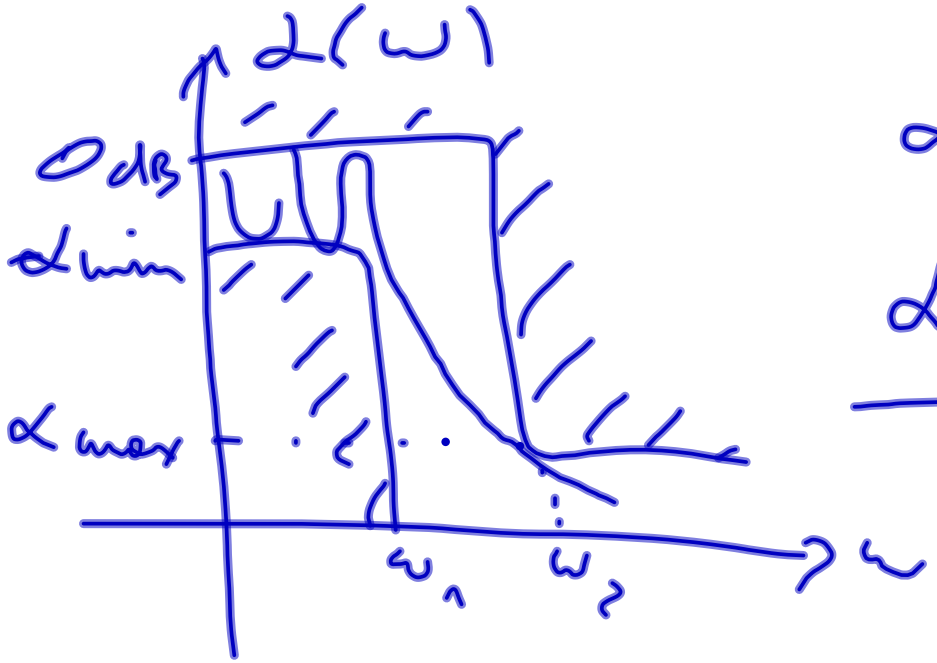
$$H(s) \cdot H(-s) = \frac{1}{1+\varepsilon^2 T_n^2\left(\frac{s}{j}\right)}$$



$$a = ch(\phi_1)$$

$$\phi_1 = \frac{1}{n} Argsh\left(\frac{1}{\varepsilon}\right)$$

$$b = ch(\phi_1)$$



$$\alpha_{min} = -10 \log\left(1+\varepsilon^2 T_n^2(\omega_1)\right)$$

$$\alpha_{max} = -10 \log\left(1+\varepsilon^2 T_n^2(\omega_2)\right)$$

$$n \geq \frac{\operatorname{arch}\left(\frac{1}{\varepsilon}\left(10^{-\frac{\alpha_{min}}{10}}-1\right)\right)}{\operatorname{arch}\left(\frac{\omega_2}{\omega_1}\right)}$$

$\alpha_{min} = -0{,}1$ dB

$\alpha_{max} = -30$

$\omega_1 = 0.1562$

$\omega_2/\omega_1 = 1{,}3$

$n = 16$

$\varepsilon \rightarrow -0.1$ dB

$|T_n(1)|^2 = 1$

$|H(j\omega_1)|^2 = \frac{1}{1+\varepsilon^2 T_n^2(\omega_1)}$ $\quad |H(j\omega_1)| = \frac{1}{\sqrt{1+\varepsilon^2}}$