ES 7.4 Pg 394

$$G(j\omega) = \frac{e^{-j\omega L}}{1 + j\omega T} = \frac{\cos(\omega L) - j\sin(\omega L)}{1 + j\omega T} \qquad |G(j\omega)| = \frac{\sqrt{\cos^2(\omega L) + \sin^2(\omega L)}}{\sqrt{1 + (\omega T)^2}} = \frac{1}{\sqrt{1+(\omega T)^2}}$$

$$\Rightarrow |G(j\omega)|_{dB} = \cancel{20 \log_{10}(1)}^{\,0} - 20 \log_{10}\left(\sqrt{1+(\omega T)^2}\right) = \underline{-20 \log_{10}\left(\sqrt{1+(\omega T)^2}\right)}$$ Modulo esatto

$$\angle G(j\omega) = \angle e^{-j\omega L} - \angle 1 + j\omega T = -\omega L - 0 - \angle \sqrt{1+(\omega T)^2} \cdot e^{j\tan^{-1}(\omega T)} = \underline{-\omega L - \tan^{-1}(\omega T)}$$ FASE esatta

Poniamo per esempio $L = \frac{1}{2}$; $T = 1$

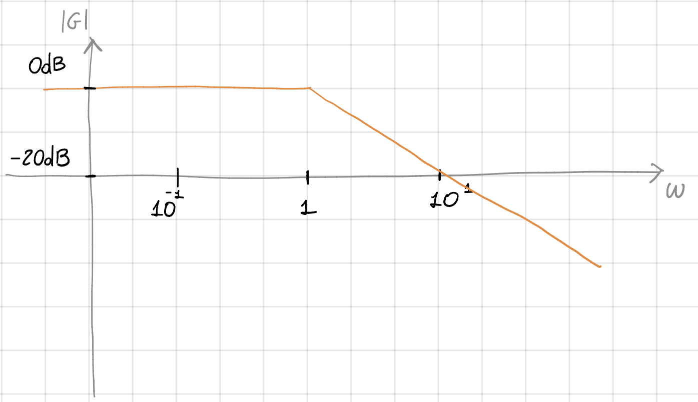
$$\Rightarrow |G(j\omega)|_{dB} = -20 \log_{10}\left(\sqrt{1+\omega^2}\right) \quad ; \quad \angle G(j\omega) = -\tfrac{1}{2}\omega - \tan^{-1}\left(\tfrac{1}{2}\omega\right)$$

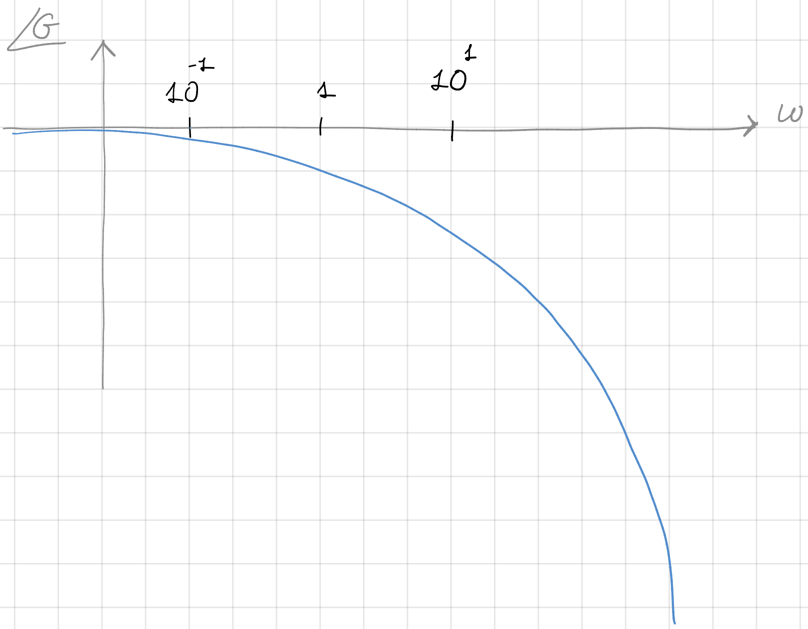
Per $\omega \to 0$ $\quad |G(j\omega)|_{dB} \cong -20 \log_{10}(\sqrt{1}) = 0\,dB \qquad \angle G(j\omega) \cong -\tan^{-1}(\omega \to 0) = 0$

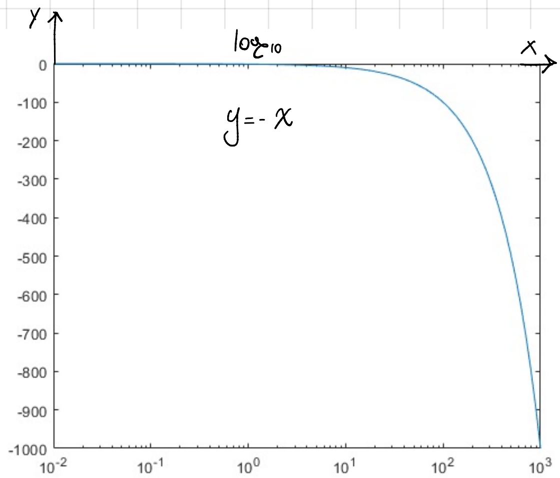
Per $\omega \to \infty$ $\quad |G(j\omega)|_{dB} \cong \underbrace{-20 \log_{10}(\omega)}_{-20dB/dec} \qquad \angle G(j\omega) \cong -\omega$ ovvero tende a $-\infty$

Siccome $G(j\omega) = \dfrac{e^{-j\omega L}}{1+j\omega T} \Rightarrow G(s) = \dfrac{e^{-sL}}{1+sT} \Rightarrow \bar{s}_p = -\dfrac{1}{T} \Rightarrow \underbrace{\omega_1 = -1}_{T=1}$

Prendo come intervallo: $\bar{\omega} \in [10^{-1} ; 10^{1}]$







Problema 7.1 - Pag 503

$$G(s) = \frac{10(s+1)}{(s+2)(s+5)}$$

Zeri: $s+1 = 0 \rightsquigarrow z_1 = -1$ Poli $p_1 = -2$; $p_2 = -5$

$\omega_1 = 1$, $\omega_2 = 2$, $\omega_3 = 5$

Guadagno

$$G(s) = 10 \frac{1+s}{\frac{1}{2}(1+2s)\frac{1}{5}(1+5s)} = 10^2 \cdot \frac{1+s}{(1+2s)(1+5s)}$$

guadagno Statico

Scelta Banda

$$\bar{\omega} = [10^{-1} ; 10^{1}]$$