ECE 2280 Circuits & Systems: Active / ECE 3500 Signals & Systems

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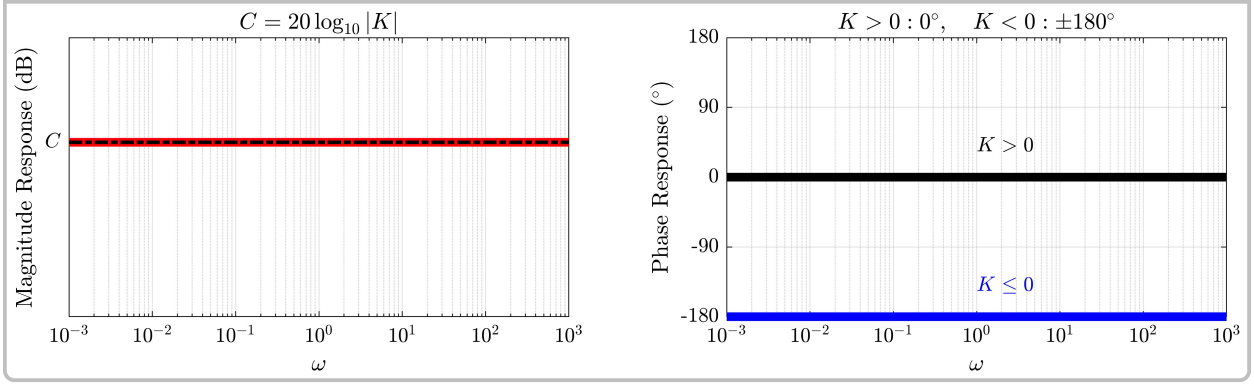
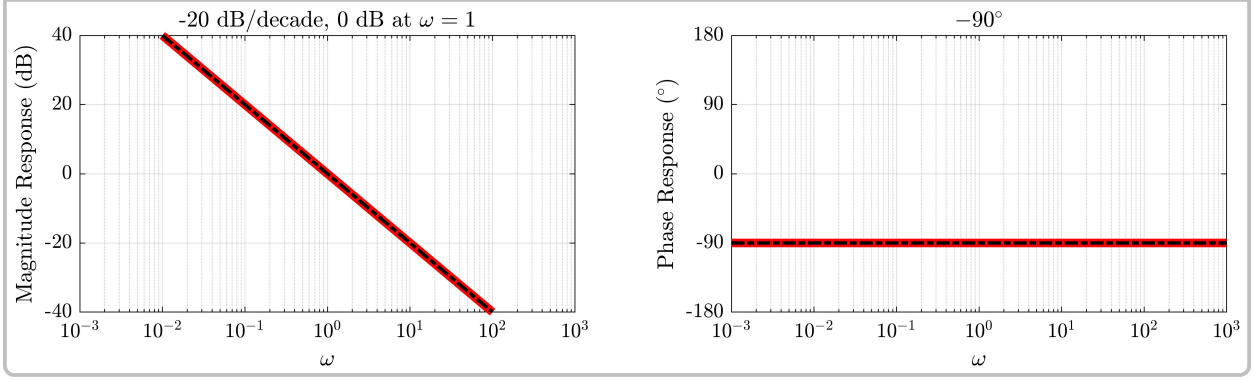
Bode Plot Handout:

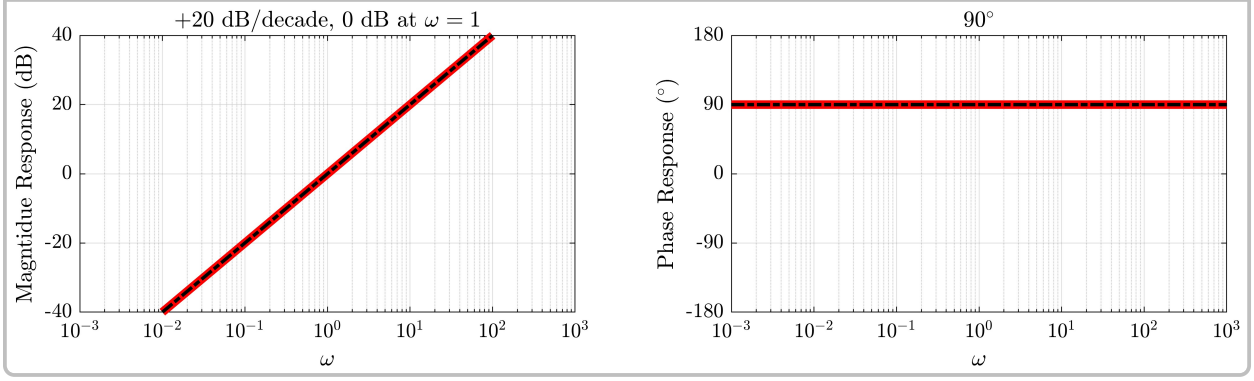
Constant value: $H(s) = K$



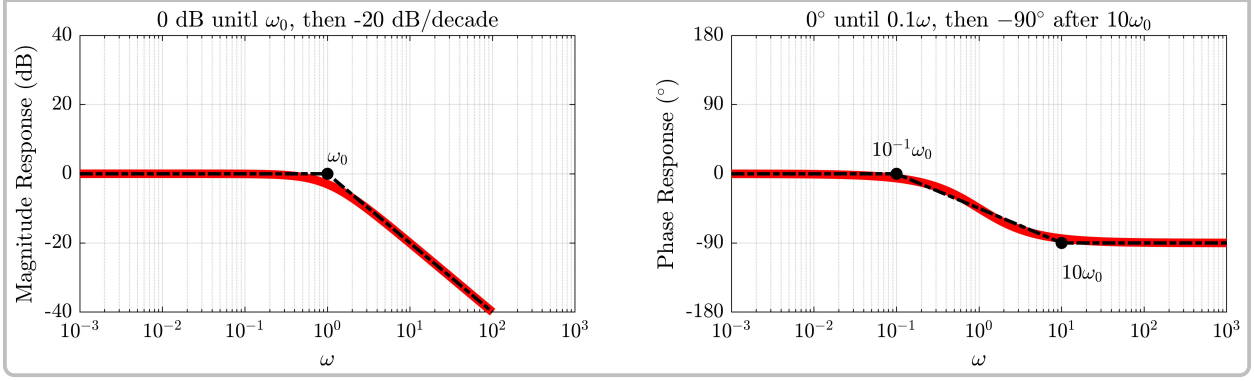
Pole at the origin: $H(s) = \frac{1}{s}$



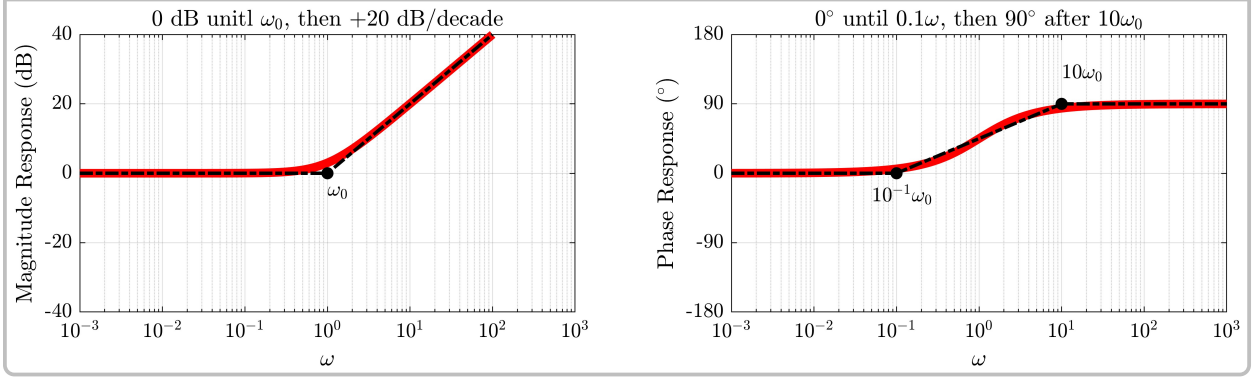
Zero at the origin: $H(s) = s$



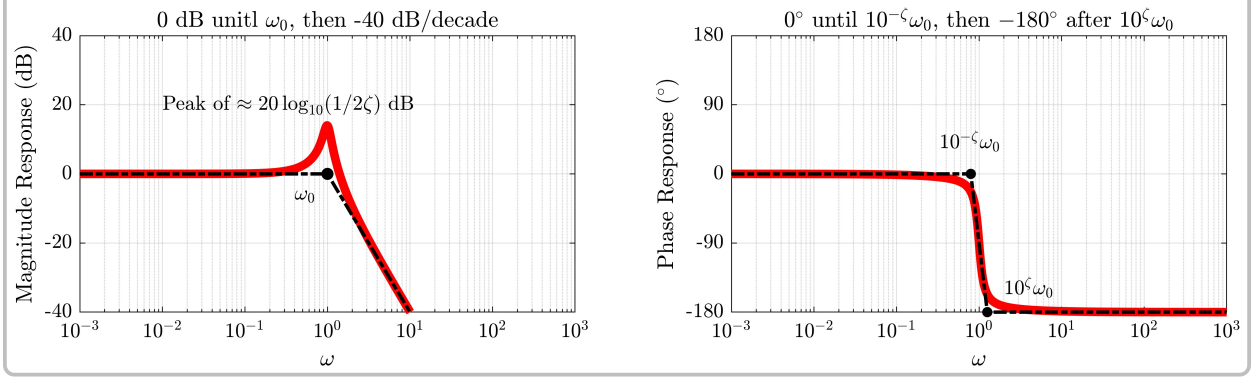
Pole at ω_0: $H(s) = \frac{1}{s/\omega_0+1}$



Zero at ω_0: $H(s) = \frac{s}{\omega_0} + 1$



Conjugate-symmetric poles: $H(s) = \frac{1}{(s/\omega_0)^2+2\zeta(s/\omega_0)+1}$



Notes

- The response of a second order pole or zero is twice that of a first order pole or zero, i.e., ∓ 40 dB/decade and $\mp 180^\circ$.
- The response of an nth order pole or zero is n times that of a first order pole or zero, i.e., $\mp n20$ dB/decade.
- Changing a pole to a zero or a zero to a pole inverts its magnitude and phase response about 0 dB/0°.
- The ∓ 3 dB point falls at ω_0 for a first order zero and pole, respectively. For a second order pole or zero at ω_0, this becomes a ∓ 6 dB point and so forth.