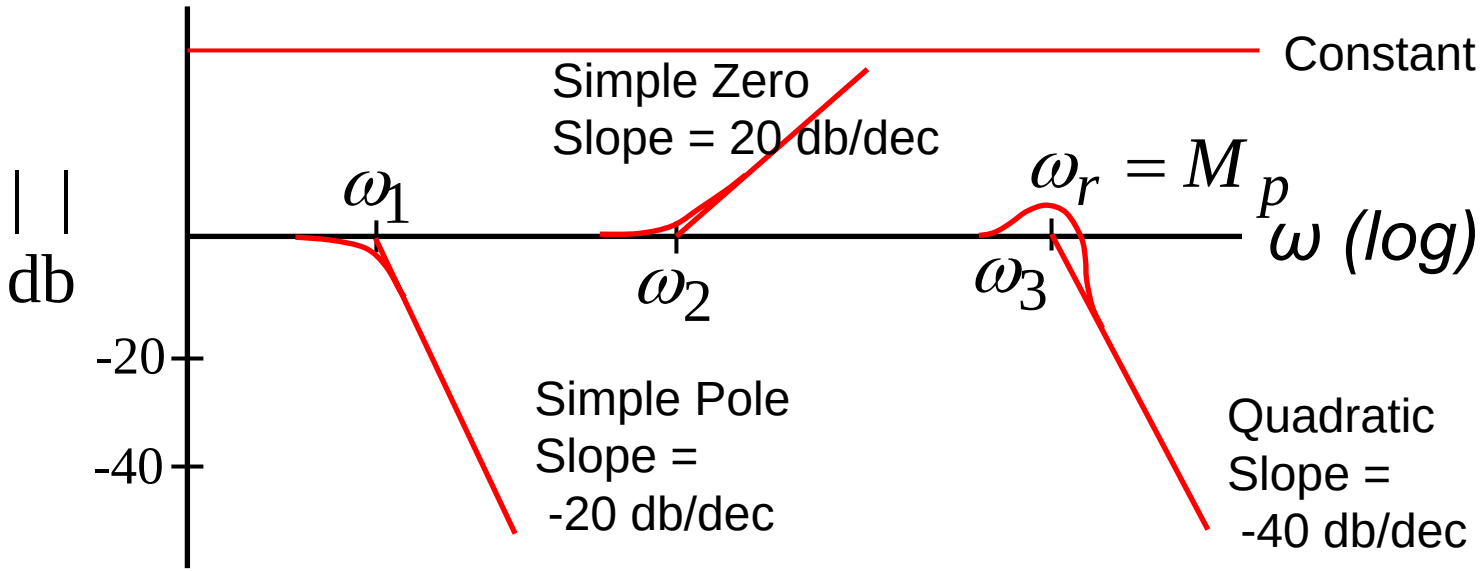
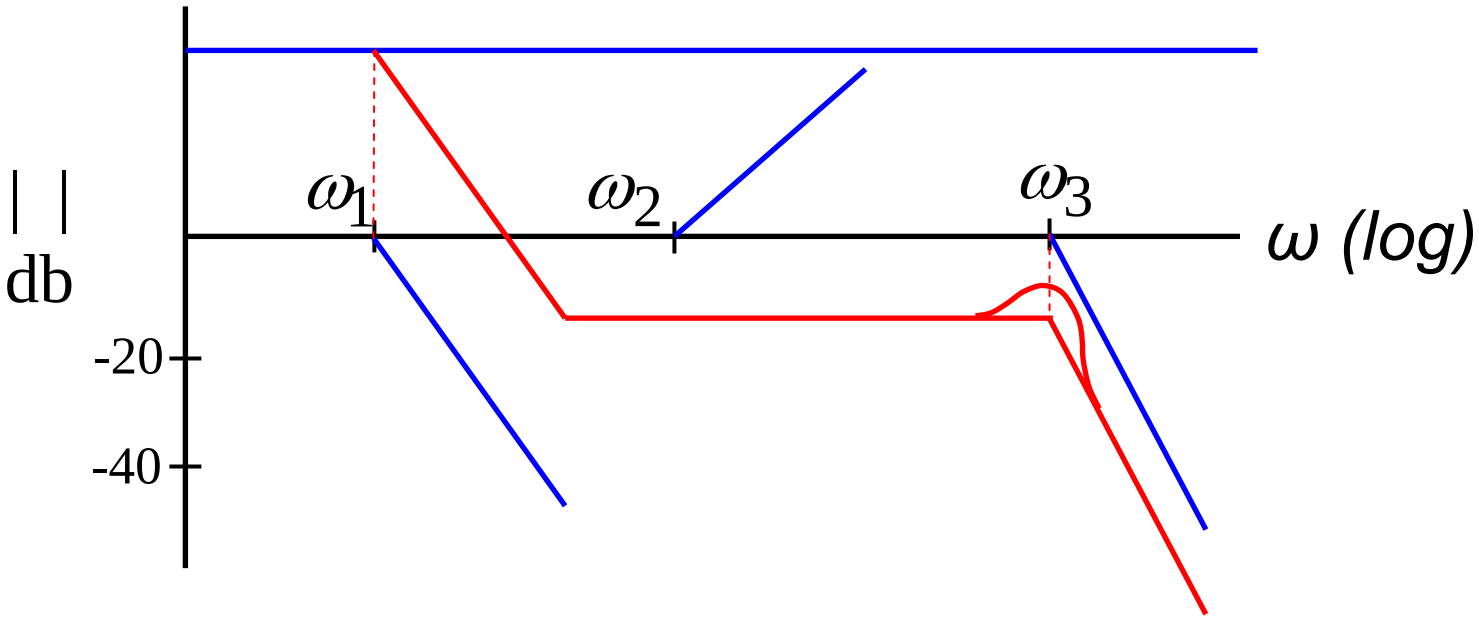
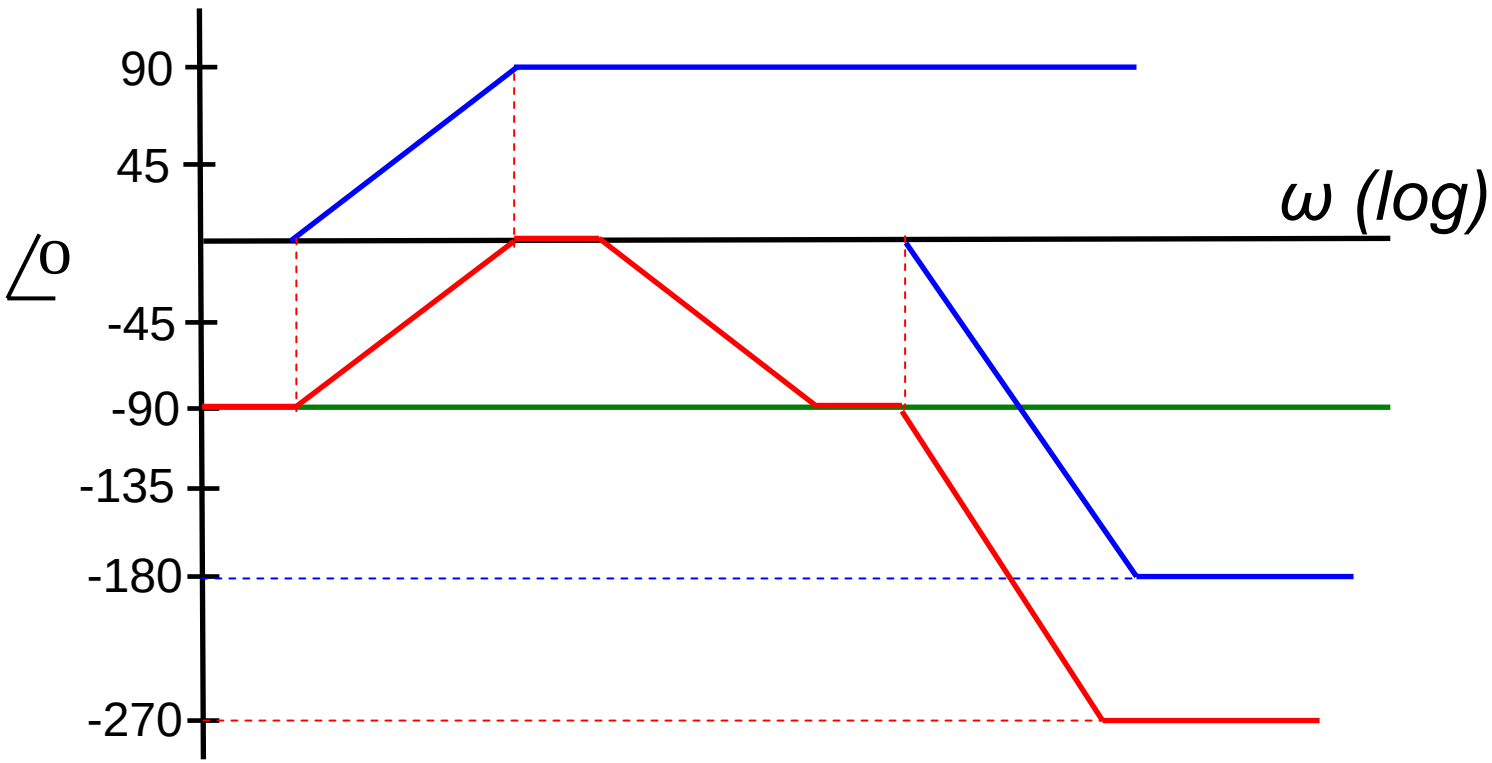
Discussion/review from last example



Magnitude



Phase



MINIMUM PHASE & NON-MINIMUM PHASE SYSTEMS

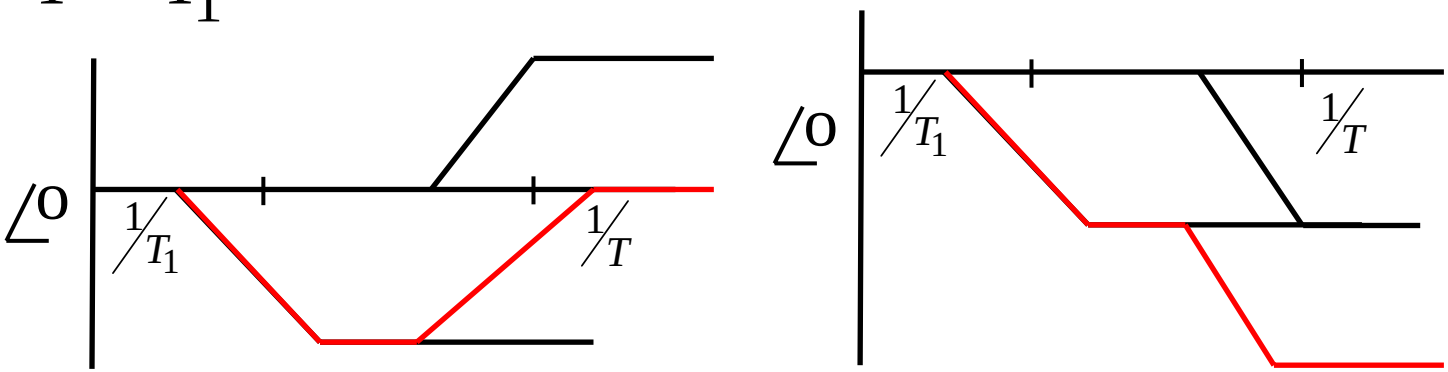
- Poles & Zeros in left-hand s-plane
  → Minimum Phase
- Poles or Zeros in right-hand s-plane
  → Non-Minimum Phase

$$G_1(j\omega) = \frac{1 + j\omega T}{1 + j\omega T_1} \qquad G_2(j\omega) = \frac{1 - j\omega T}{1 + j\omega T_1}$$

$$\angle G_1 = \text{atan}\left(\frac{\omega T}{1}\right) - \text{atan}\left(\frac{\omega T_1}{1}\right)$$

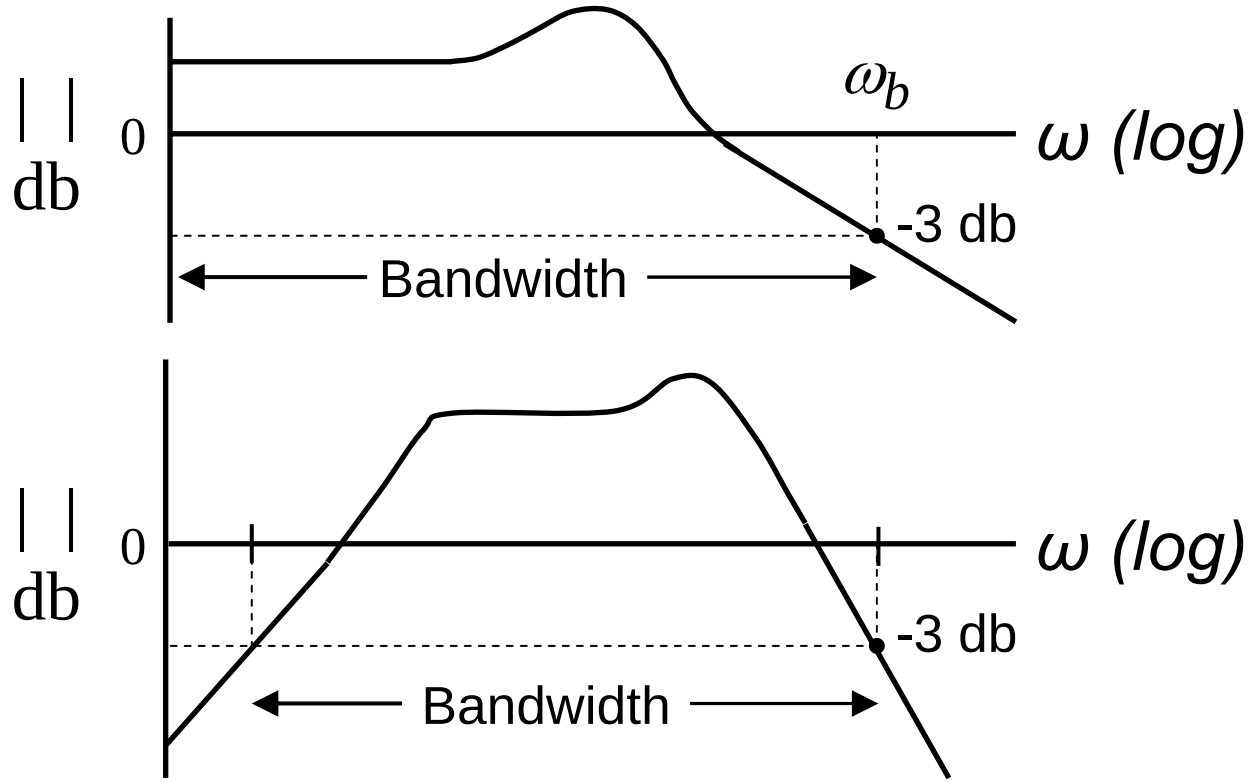
$$\angle G_2 = \text{atan}\left(\frac{-\omega T}{1}\right) - \text{atan}\left(\frac{\omega T_1}{1}\right)$$

$$\frac{1}{T} > \frac{1}{T_1}$$



CUT-OFF FREQUENCY OR BANDWIDTH

Cut-off frequency is the frequency at which the magnitude of the closed loop frequency is at 3 db below the zero frequency value.



Find the attenuation factor at -3 db magnitude.
(Find real # corresponding to magnitude of -3 db)