

Bandwidth example

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

$$\omega_{BW} = 50 \text{ rad/s}$$

step 2 phase between  $-135$  and  $-225$

at  $50 \text{ rad/s}$  phase  $-92$   $\times$

$$\zeta_M = 84.7^\circ \Rightarrow \zeta = 1.5 \Rightarrow \%OS = 0$$

If  $G$  is closed loop

$$\omega_{BW} = 2 \text{ rad/s}$$

$$M_p = 250 \text{ dB}$$

$$250 = 20 \log_{10} \text{mag}$$

$$12.5 = \log_{10} \text{mag}$$

$$10^{12.5} = \text{mag} = 3.16 \times 10^{12}$$

$$M_p = \frac{1}{2\zeta \sqrt{1-\zeta^2}} = 3.16 \times 10^{12}$$

$\zeta$  small