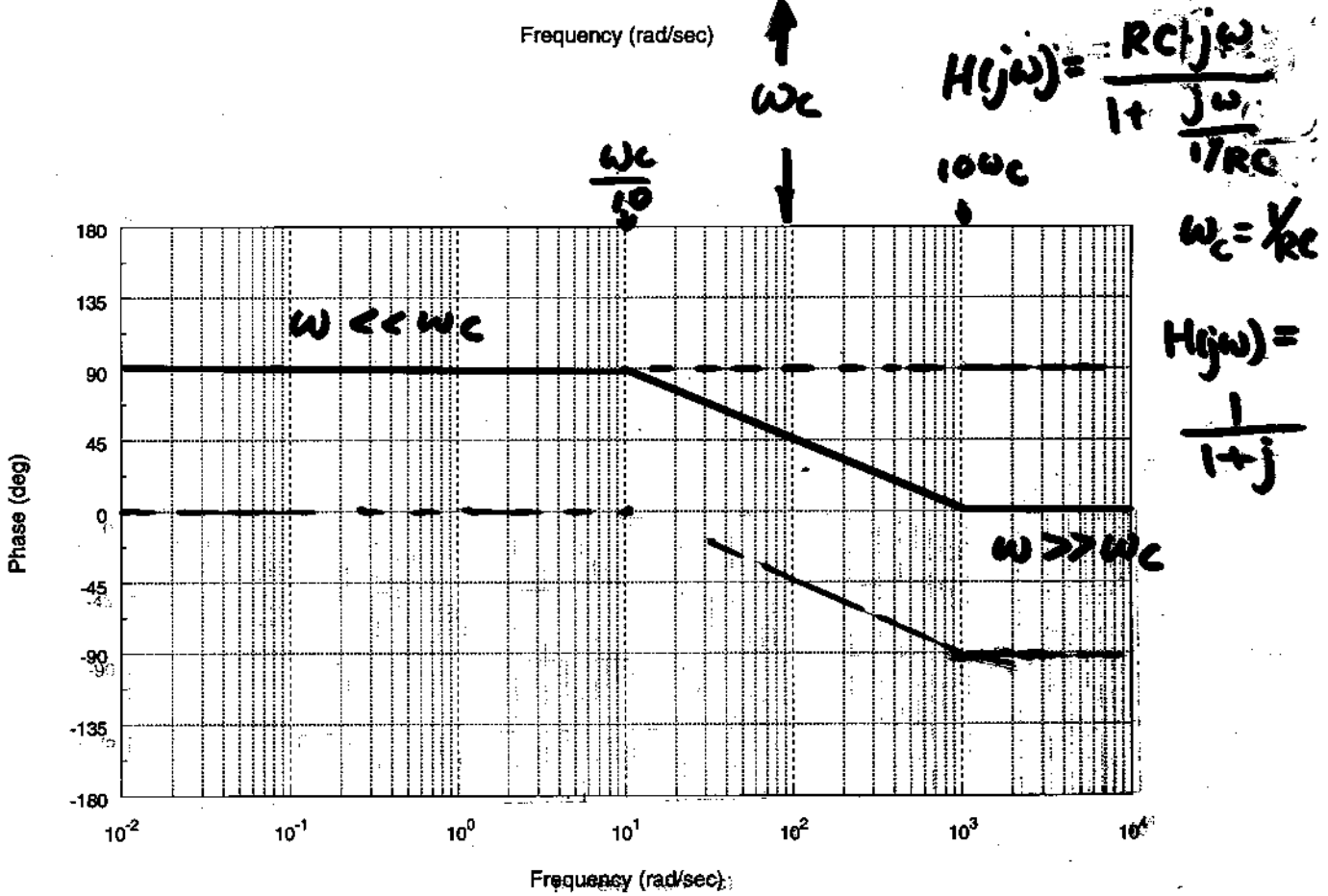
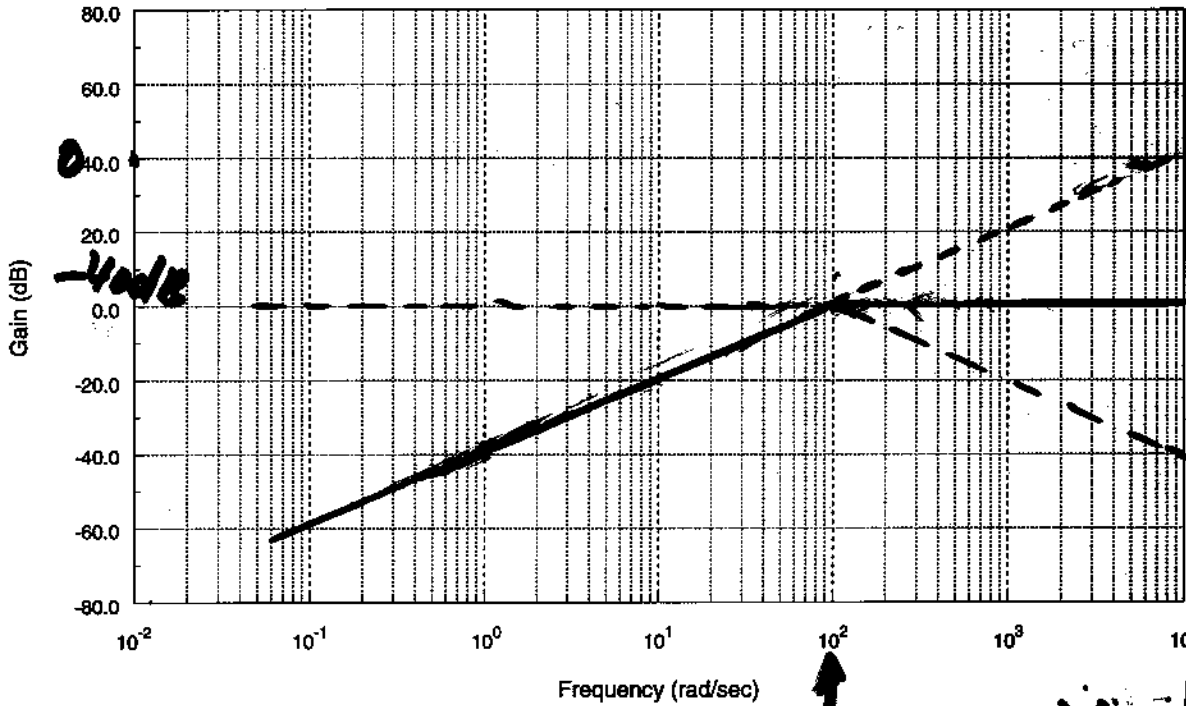
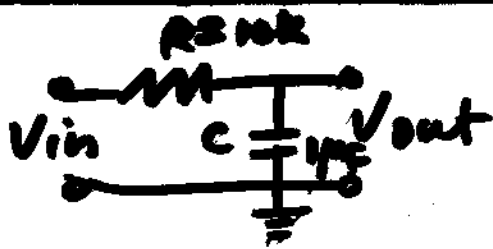


$$H(s) = \frac{V_{out}(s)}{V_{in}(s)} = \frac{RCs}{RCs + 1} = \frac{RCs}{1 + \frac{s}{1/RC}}$$

$\frac{1}{RC} = 100$ $RC = 10^{-2}$ sec/rad.



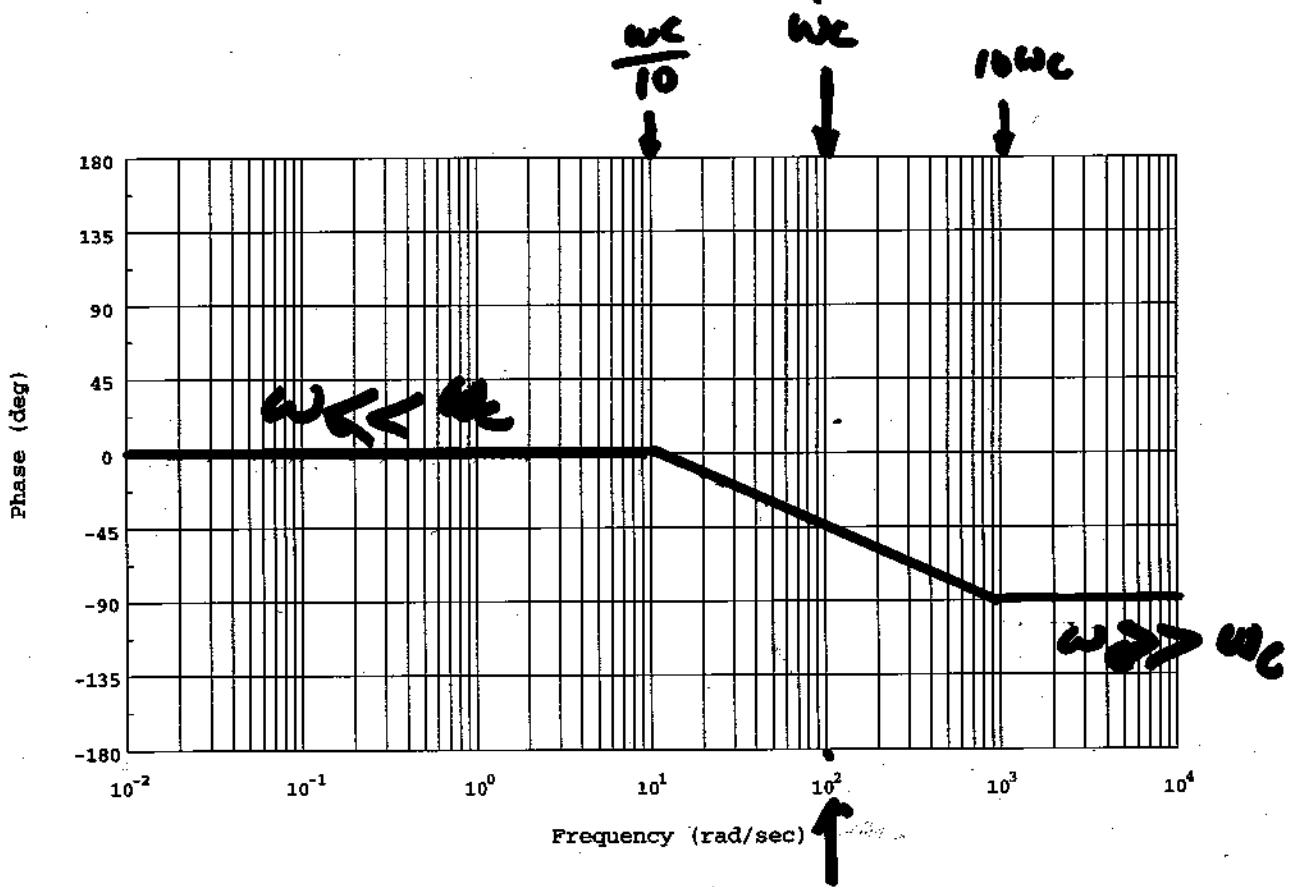
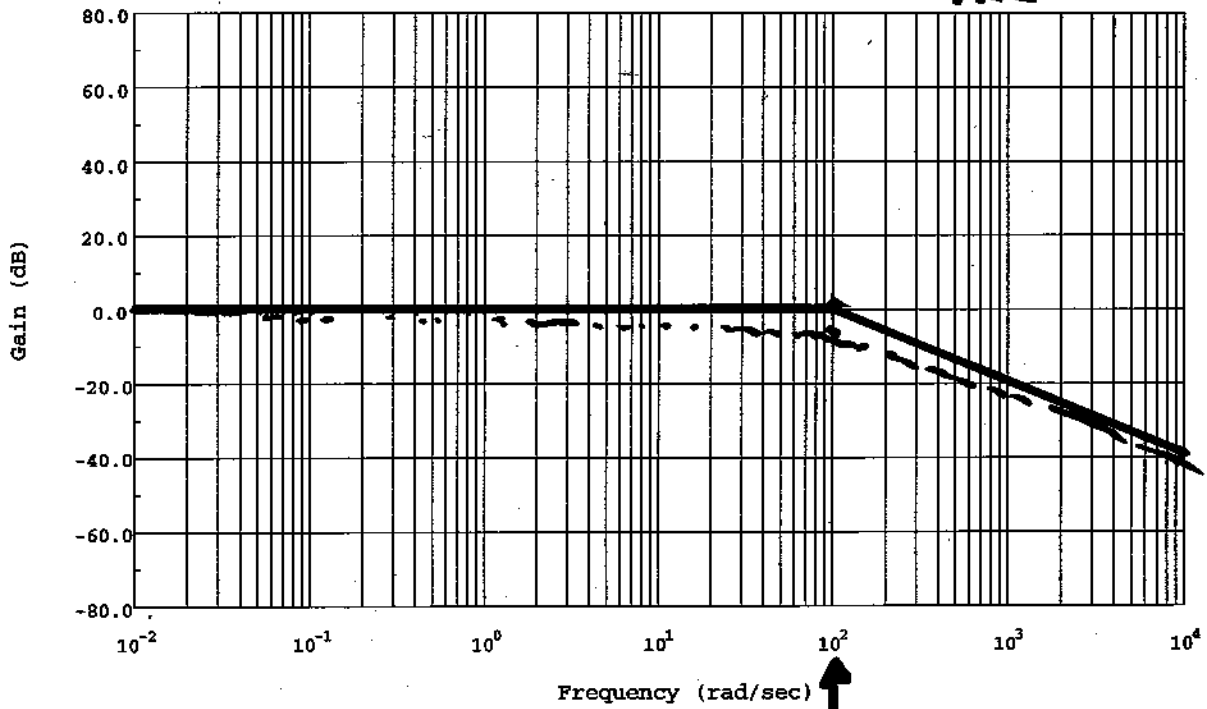


$$H(s) = \frac{1}{RCs + 1} = \frac{1}{1 + \frac{s}{1/RC}}$$

$$H(j\omega) = \frac{1}{1 + \frac{j\omega}{1/RC}} \quad \omega_c = 1/RC$$

$$RC = 10^{-2}$$

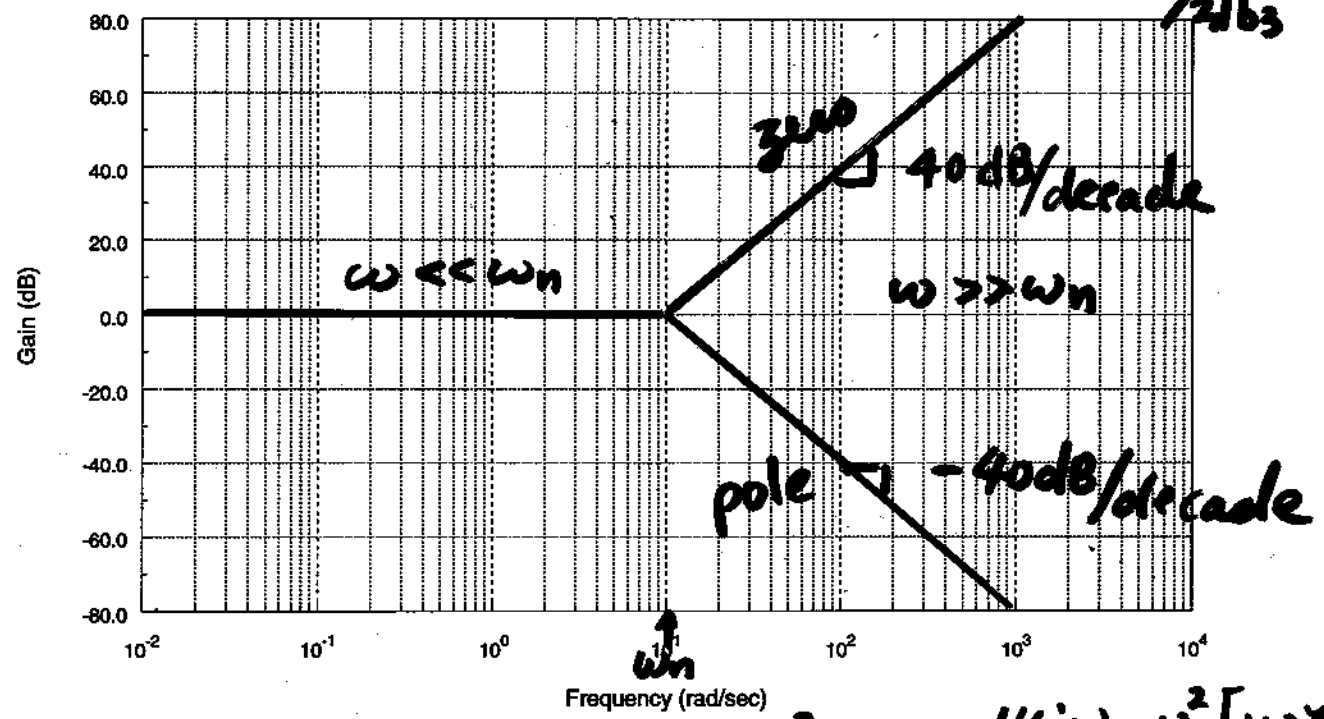
$$\omega_c = 100$$



$$H(s) = s^2 + b_2 s + b_3 \Big|_{s=j\omega} = H(j\omega) = (j\omega)^2 + b_2 j\omega + b_3$$

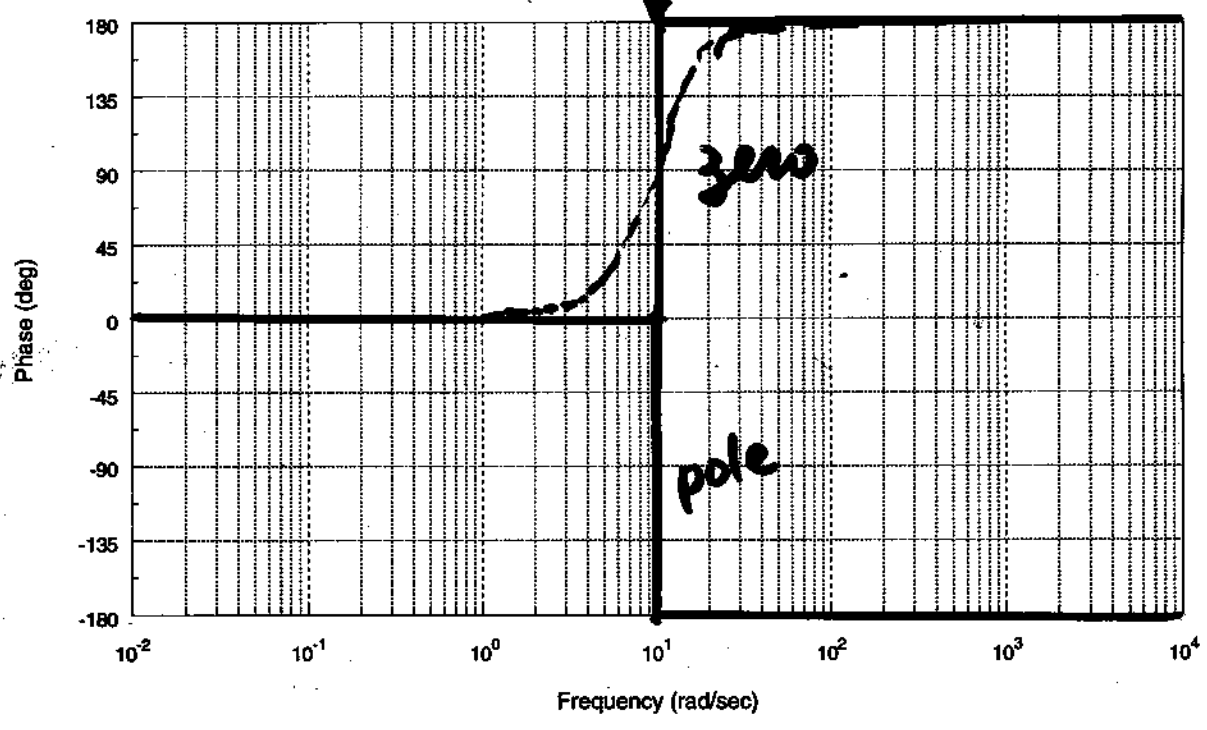
$$= b_3 \left(\frac{(j\omega)^2}{b_3} + \frac{b_2}{b_3} j\omega + 1 \right) \text{ Let: } b_3 = \omega_n^2$$

$$\frac{b_2}{2\sqrt{b_3}} = \zeta$$



Frequency selectivity: $1 + 2\zeta j \left(\frac{\omega}{\omega_n}\right) + \left(\frac{j\omega}{\omega_n}\right)^2$

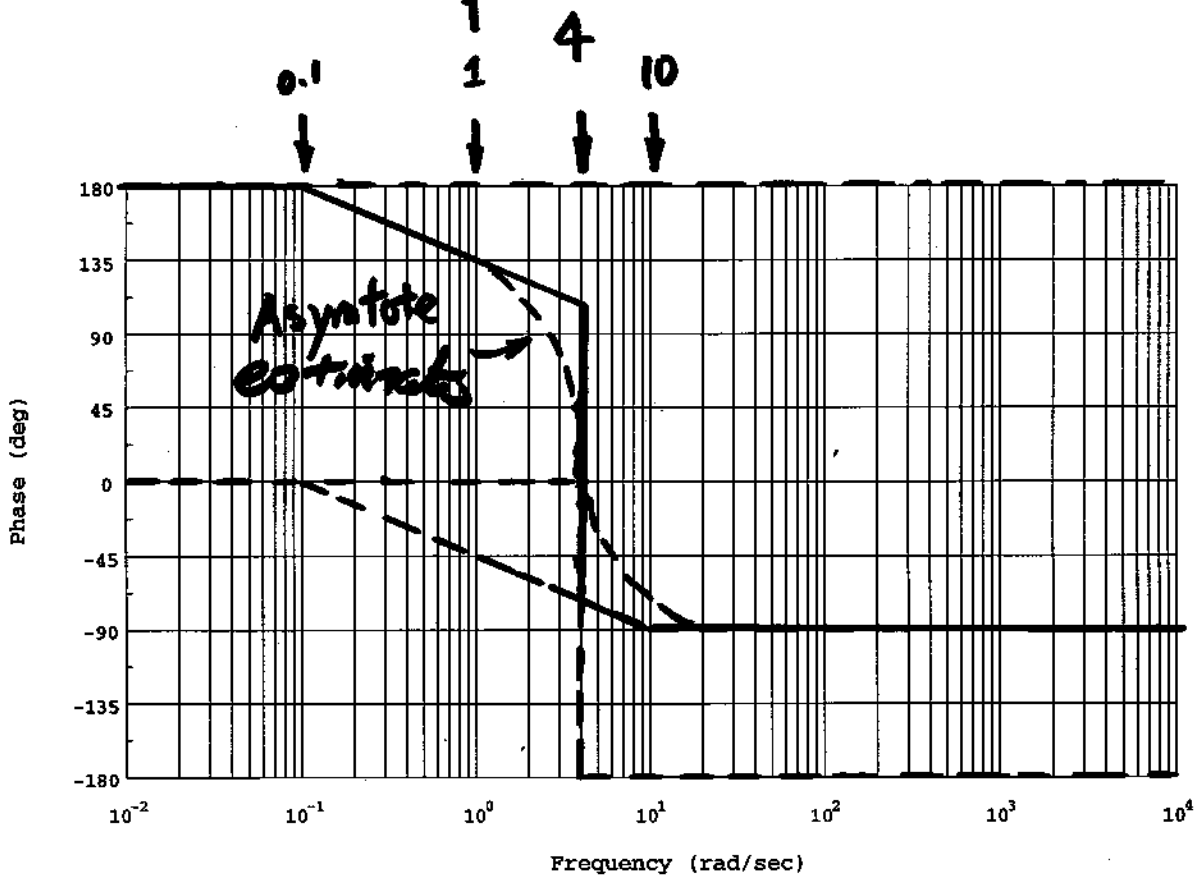
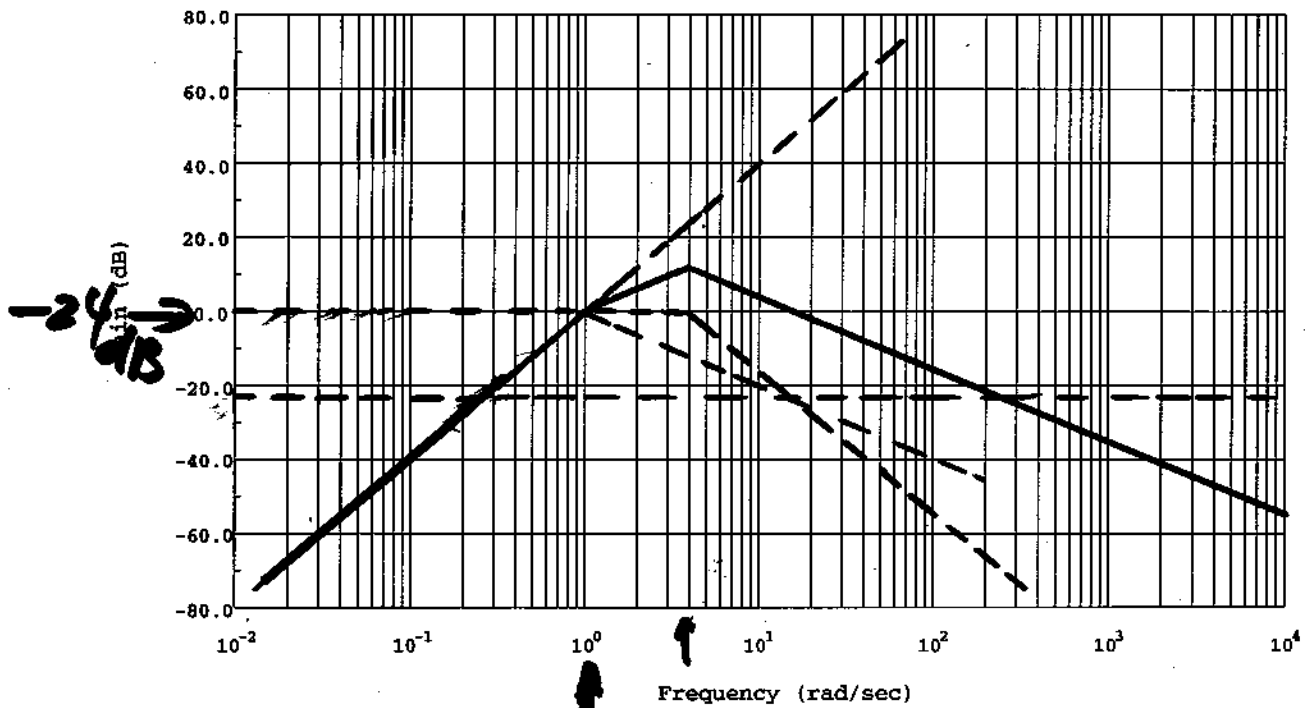
$$H(j\omega) = \omega_n^2 \left[1 + 2\zeta j \frac{\omega}{\omega_n} + \frac{(j\omega)^2}{\omega_n^2} \right]$$



$$7.2.2 (a) \quad H(s) = \frac{s^2}{(s+1)(s^2+4s+16)} = \frac{1}{16} \frac{s^2}{(s+1)(\frac{s^2}{16} + \frac{s}{4} + 1)}$$

$$20 \log_{10} \left(\frac{1}{16} \right) = -20 \log_{10} 16 = -24 \text{ dB} \quad \omega_n = \sqrt{16} = 4$$

$$\zeta = \frac{4}{2\sqrt{16}} = 0.5$$



$$\text{Example: } H(s) = \frac{20s(s+100)}{(s+2)(s+10)} = \frac{20 \cdot 100 \cdot s \left(\frac{s}{100} + 1\right)}{(s+2)(s+10)}$$

$$= \frac{100s \left(\frac{s}{100} + 1\right)}{\left(\frac{s}{2} + 1\right) \left(\frac{s}{10} + 1\right)} \quad 20 \log 100 = \underline{40 \text{ dB}}$$

