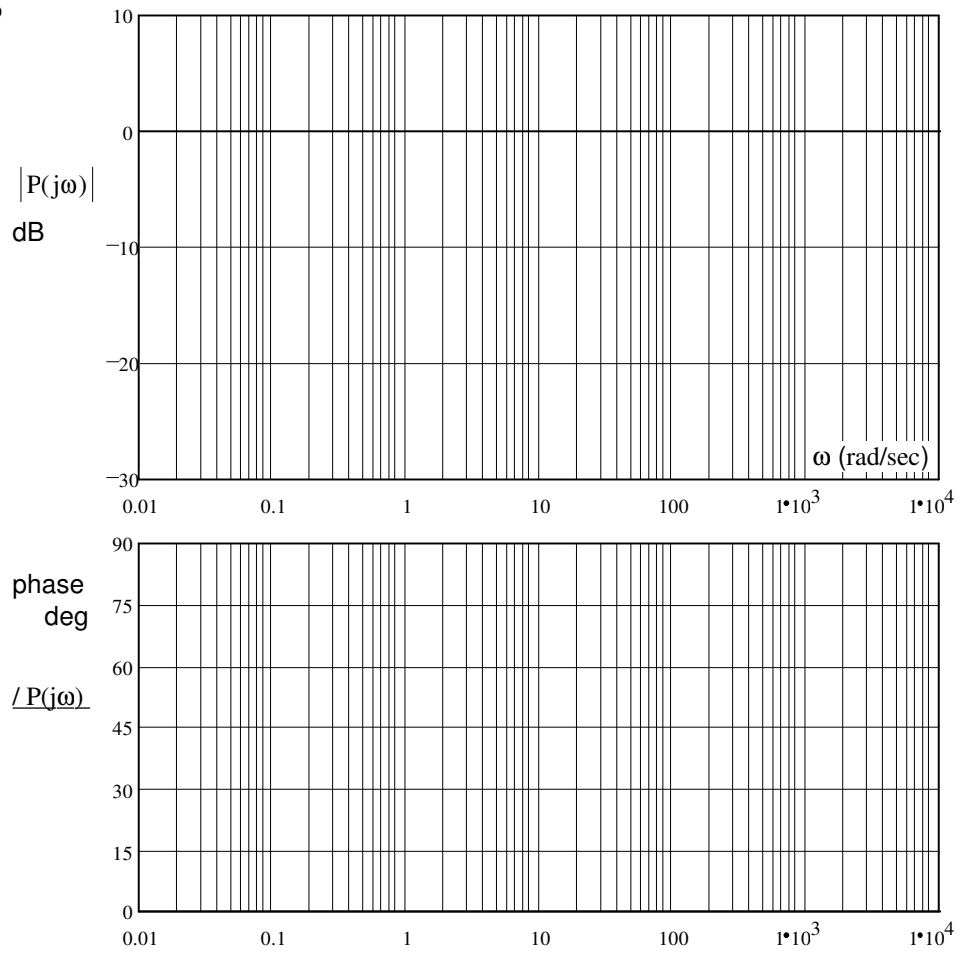


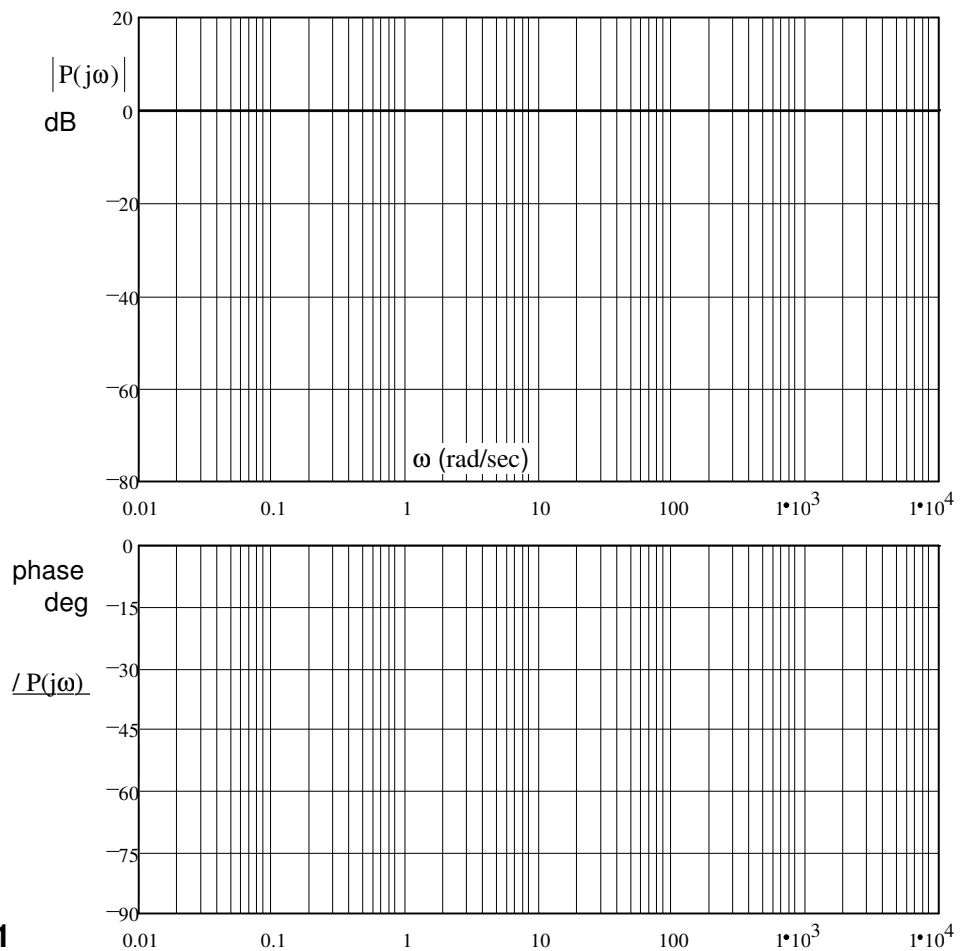
# ECE 3510 Bode Plot Examples

A. Stolp  
3/11/08

**Ex. 1**      $P(s) = \frac{2 \cdot (s + 10)}{s + 100}$



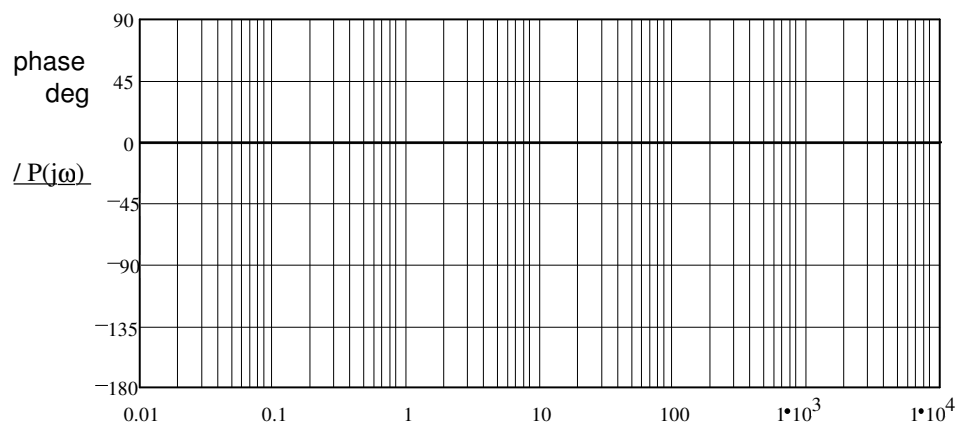
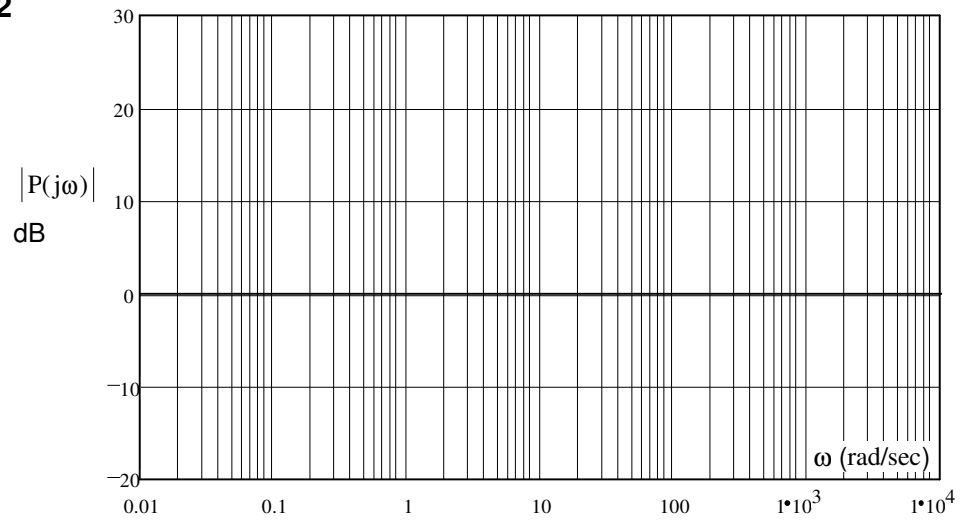
**Ex. 2**      $P(s) = \frac{s + 20}{4 \cdot (s + 1)^2}$



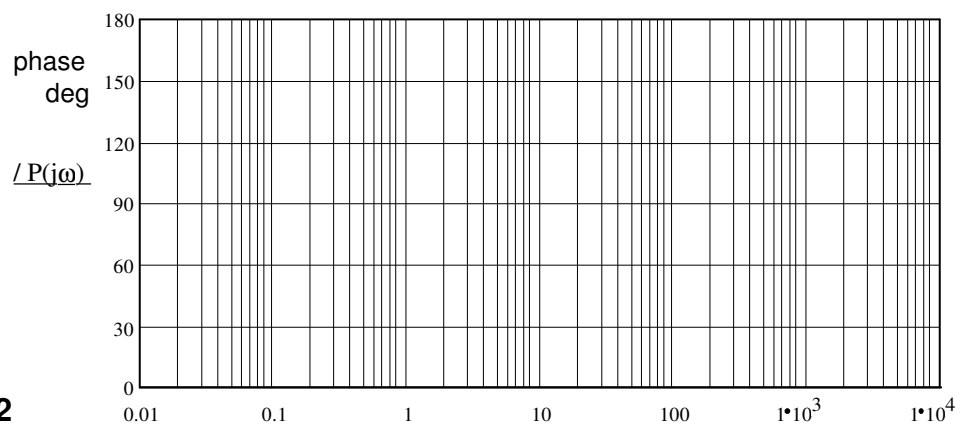
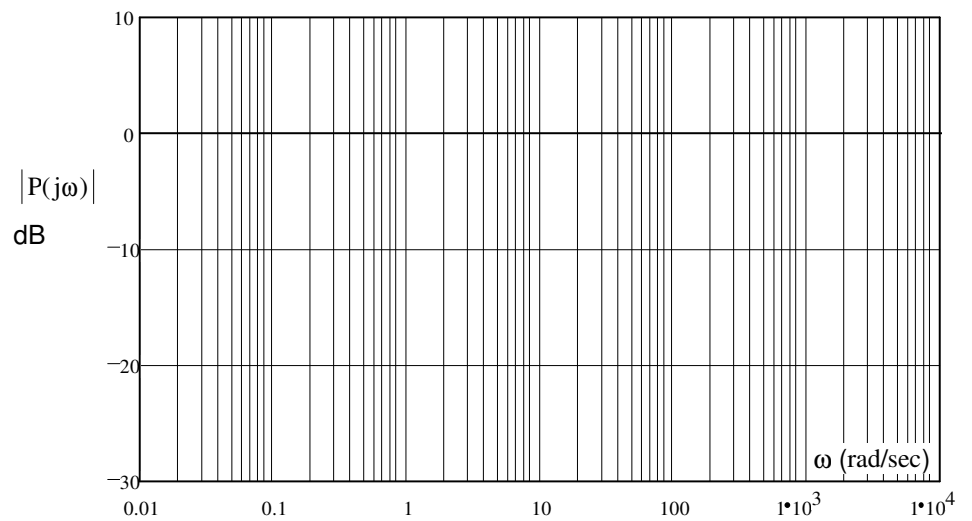
## ECE 3510 Bode Examples p.2

Ex. 3

$$P_3(s) := \frac{20000 \cdot (s + 0.1)}{(s - 4) \cdot (s + 1000)}$$



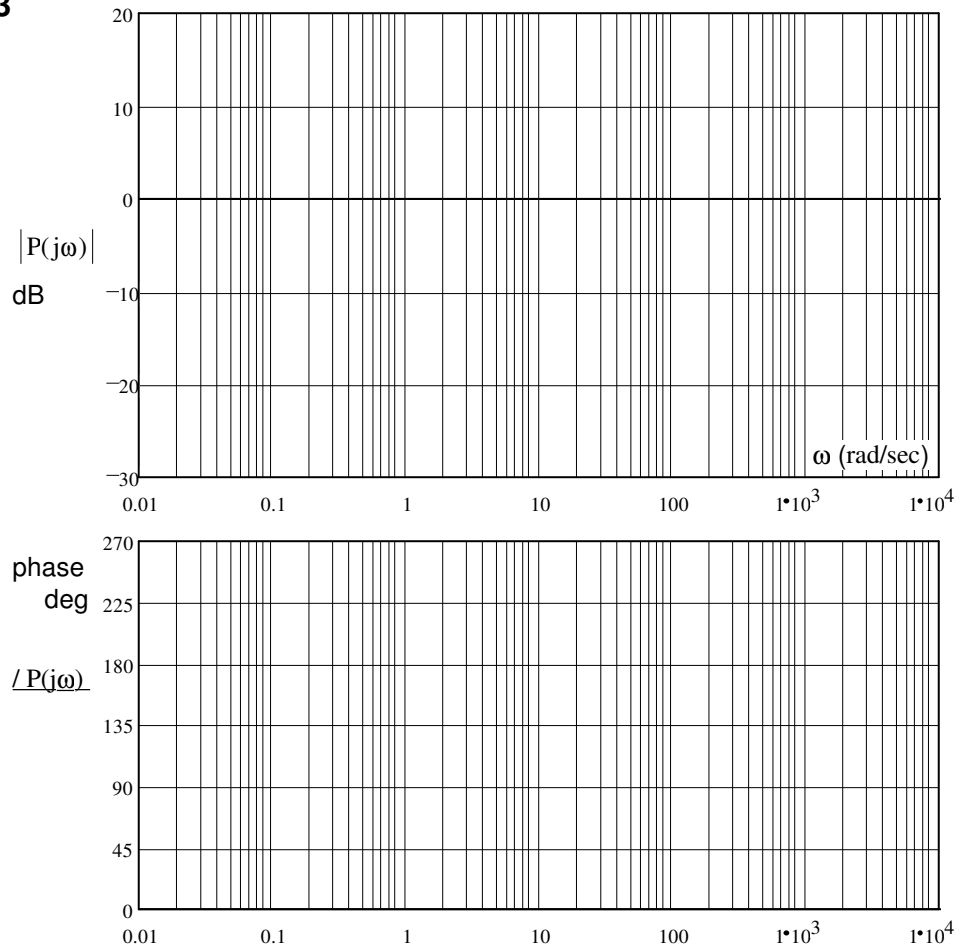
Ex. 4  $P_4(s) := \frac{0.5 \cdot (s + 1) \cdot (s - 20)}{s \cdot (s + 100)}$



### ECE 3510 Bode Examples p.3

Ex. 5

$$P_5(s) := \frac{5000 \cdot s \cdot (s - 4)}{(s + 0.2) \cdot (s + 20) \cdot (-s + 1000)}$$



Ex. 6

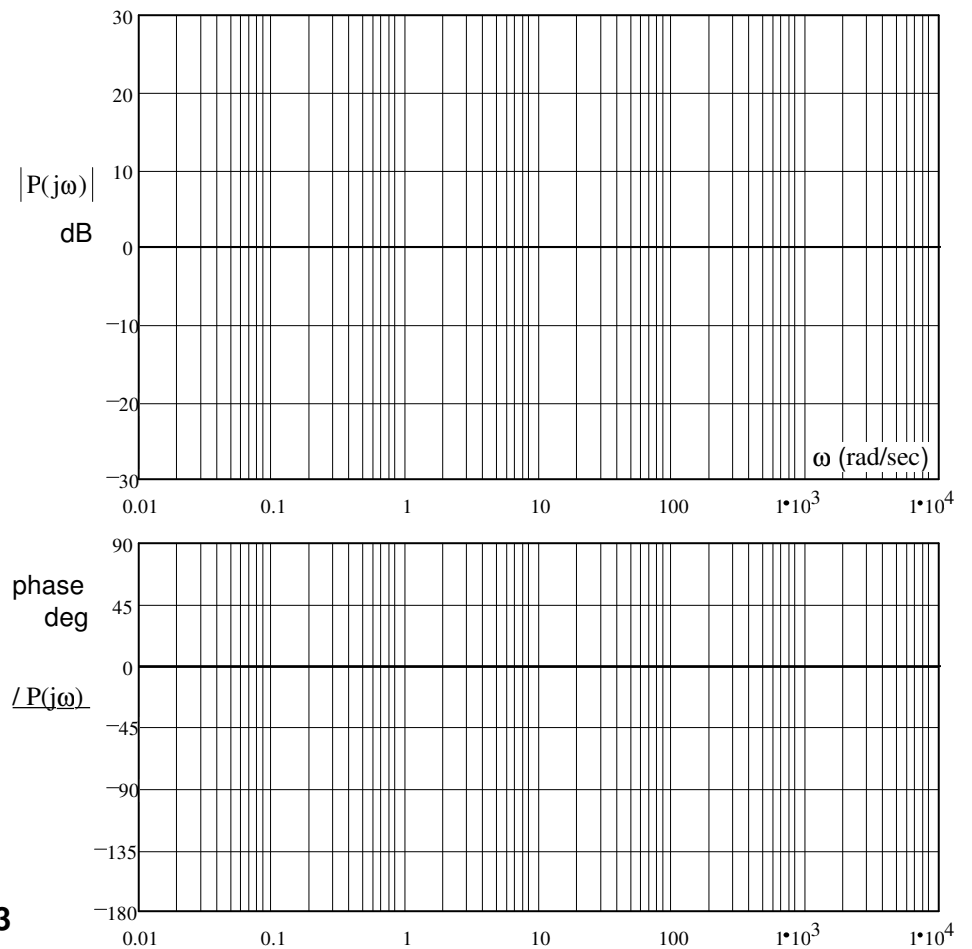
$$P_6(s) := \frac{20000 \cdot (s + 0.1)}{(s + 2) \cdot (s^2 + 10 \cdot s + 10000)}$$

$$s^2 + 2 \cdot \zeta \cdot \omega_n \cdot s + \omega_n^2$$

natural frequency  $\omega_n = \sqrt{\omega_n^2} =$

damping factor:  $\zeta = \frac{2 \cdot \zeta \cdot \omega_n}{2 \cdot \omega_n} =$

peak:  $20 \cdot \log\left(\frac{1}{2 \cdot 0.05}\right) = 20$



# ECE 3510 Bode Examples p.4

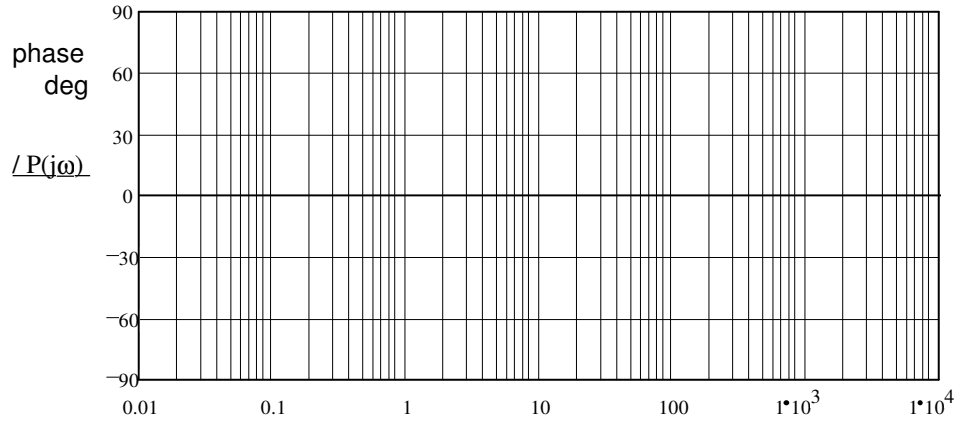
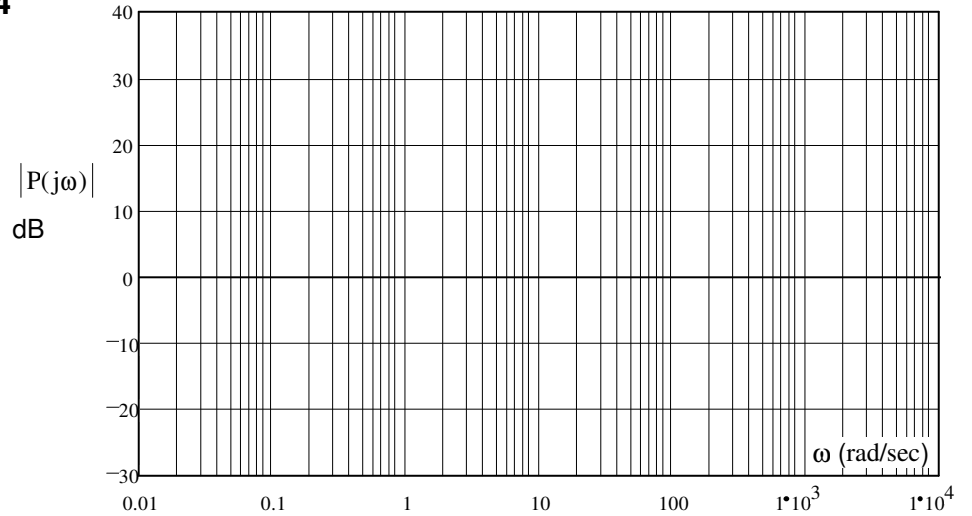
## Ex. 7

$$P_7(s) := \frac{400 \cdot (s + 0.1) \cdot (s + 100)}{[(s + 0.4)^2 + 15.84] \cdot (s + 1000)}$$

natural freq.  $(s + a)^2 + b^2$

$$\omega_n = \sqrt{a^2 + b^2} =$$

damping factor:  $\zeta = \frac{a}{\omega_n} = \frac{1}{2 \cdot \zeta} =$



## Ex. 8

$$P_8(s) := \frac{(s + a)^2 + b^2}{25 \cdot [(s + 10)^2 + 9900]} \cdot \frac{1}{(s^2 + s + 4) \cdot (s + 2000)}$$

$$s^2 + 2 \cdot \zeta \cdot \omega_n \cdot s + \omega_n^2$$

natural frequency  $\omega_{n1} = \sqrt{\omega_{n1}^2} =$

damping factor:  $\zeta = \frac{2 \cdot \zeta \cdot \omega_{n1}}{2 \cdot \omega_{n1}} =$

natural freq.  $\omega_{n2} = \sqrt{a^2 + b^2} =$

damping factor:  $\zeta = \frac{a}{\omega_n} = \frac{1}{2 \cdot \zeta} =$

