EE 380: Home Work #6

E8.11 The Bode plot is shown in Figure E8.11. The frequency when $20 \log_{10} |G_C G(j\omega)| = 0$ is $\omega = 9.9$ rad/sec.

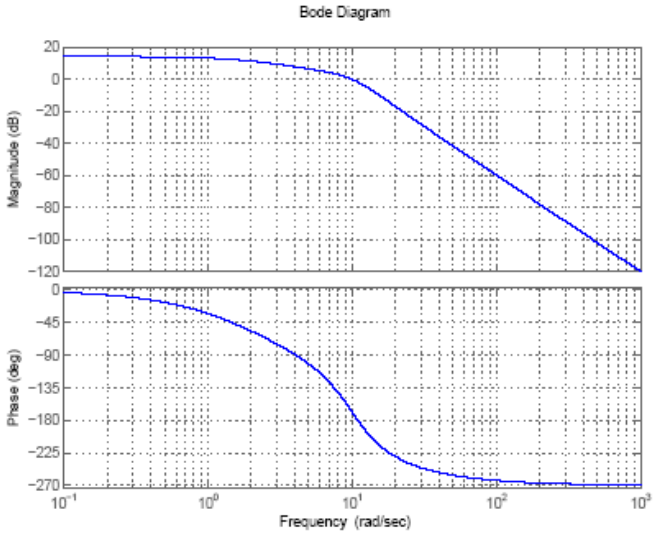

FIGURE E8.11
Bode Diagram for $G_c(s)G(s) = \frac{1000}{(s^2+10s+100)(s+2)}$.

P8.1

(d) The transfer function is

$$G_c(s)G(s) = \frac{30(s+8)}{s(s+2)(s+4)} .$$

The polar plot is shown in Figure P8.1d. A summary of the magnitude and phase angles for

$$\omega = 1,\ 0.1,\ 0.8,\ 1.6,\ 3.2,\ 12.8,\ \infty$$

can be found in Table P8.1d.

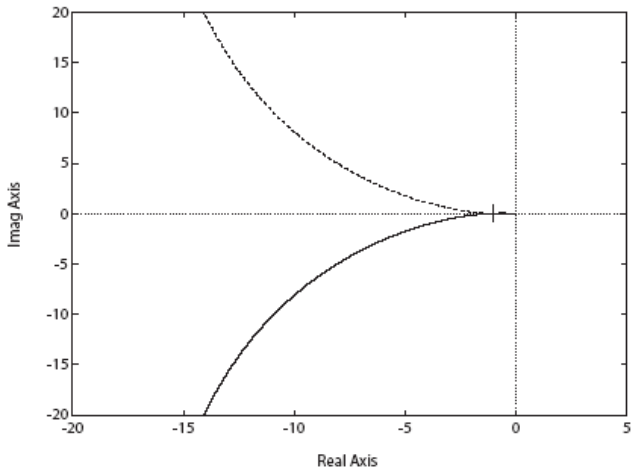

FIGURE P8.1

ω	0	0.1	0.8	1.6	3.2	12.8	∞
$\lvert GH(j\omega)\rvert$	∞	299.6	34.3	13.9	4.4	0.20	0
$\phi(deg)$	-90^o	-93.6^o	-117.4^o	-139.1^o	-163.8^o	-185.8^o	-180^o

TABLE P8.1 CONTINUED: (d) Magnitudes and phase angles for $G_c(s)G(s) = \frac{30(s+8)}{s(s+2)(s+4)}$.

P8.16 (a) The unit step input response is shown in Figure P8.16. The closed-

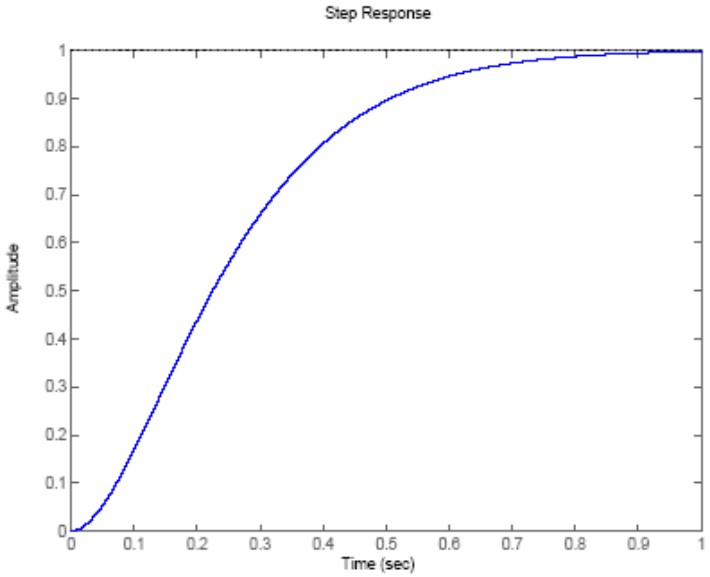

FIGURE P8.16
Unit step input response for $T(s) = \frac{53.5}{s^2+14.1s+53.5}$.

loop transfer function is

$$T(s) = \frac{Y(s)}{R(s)} = \frac{53.5}{s^2 + 14.1s + 53.5} \ .$$

(b) The system bandwidth is $\omega_B = 4.95$ rad/sec.

P8.23 The transfer function is

$$G(s) = \frac{100(s+20)(s+8000)}{(s+1)(s+80)(s+500)} \ .$$

The system is type 0 and the steady-state error to a unit step input is

$$e_{ss} = \frac{1}{1+K_p} = 0.0025$$

since

$$K_p = \lim_{s\to 0} G(s) = 400 \ .$$

AP8.4 The Bode plot is shown in Figure AP8.4.

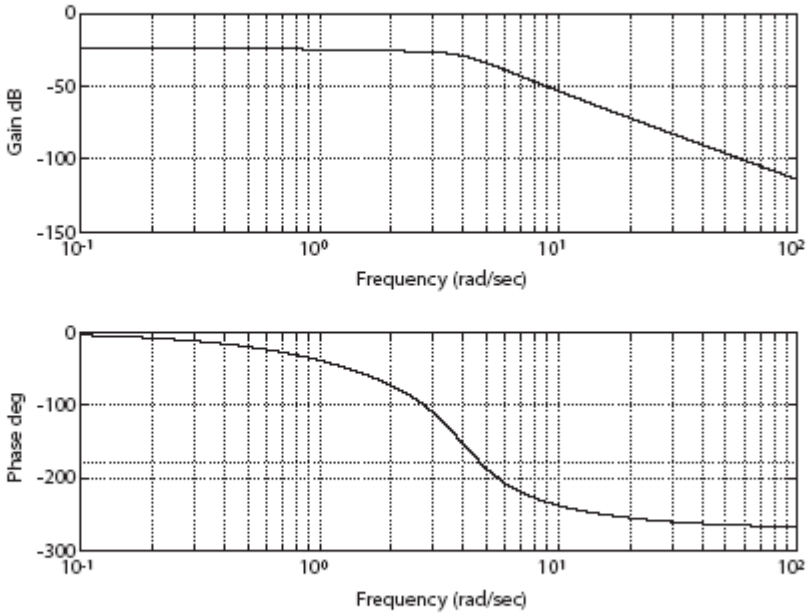

FIGURE AP8.4
Bode plot for $GH(s) = \frac{0.0625}{(0.5s+1)(0.0625s^2+0.2s+1)}$.