10. Use the Bode approach to sketch the magnitude of each of the following responses, then verify your solutions with appropriate MATLAB simulations:

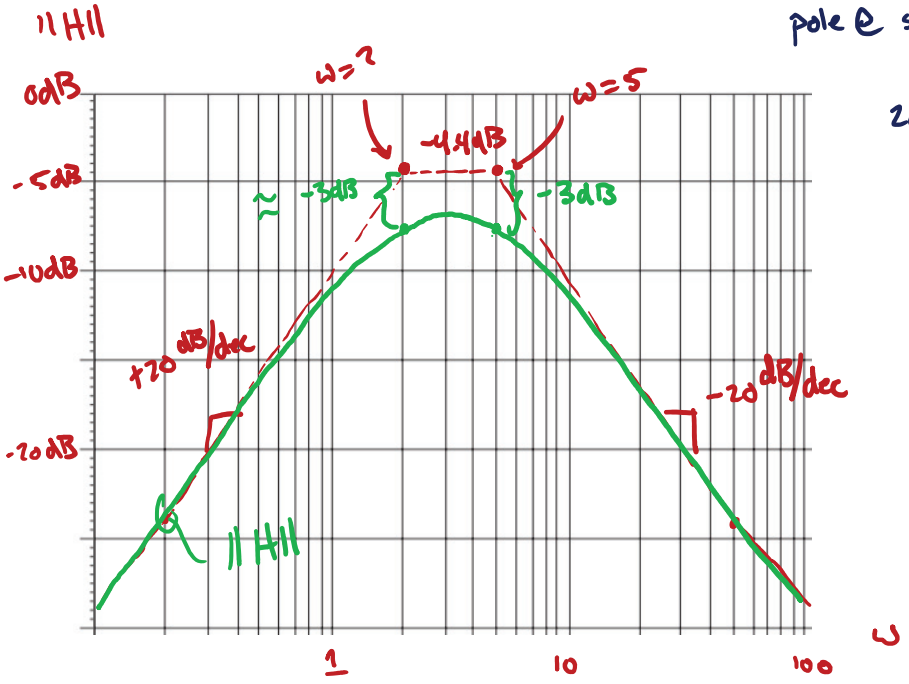
(*a*) $3\dfrac{s}{s^2 + 7s + 10}$; (*b*) $\dfrac{4}{s^3 + 7s^2 + 12s}$.

a) $\dfrac{3s}{(s+5)(s+2)}$ → zero at DC, real poles at $\omega = 2$, $\omega = 5$

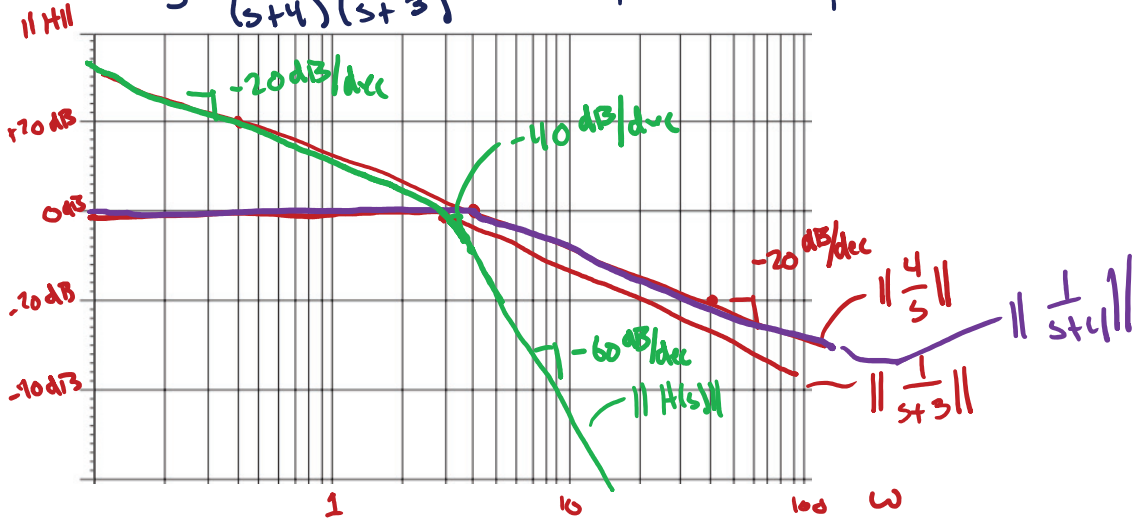
Rewrite as $\dfrac{3s}{5\left(\frac{s}{5}+1\right)\left(1+\frac{2}{5}\right)s} = \dfrac{3/5}{\left(\frac{s}{5}+1\right)\left(1+\frac{2}{5}\right)}$ ← Midband gain

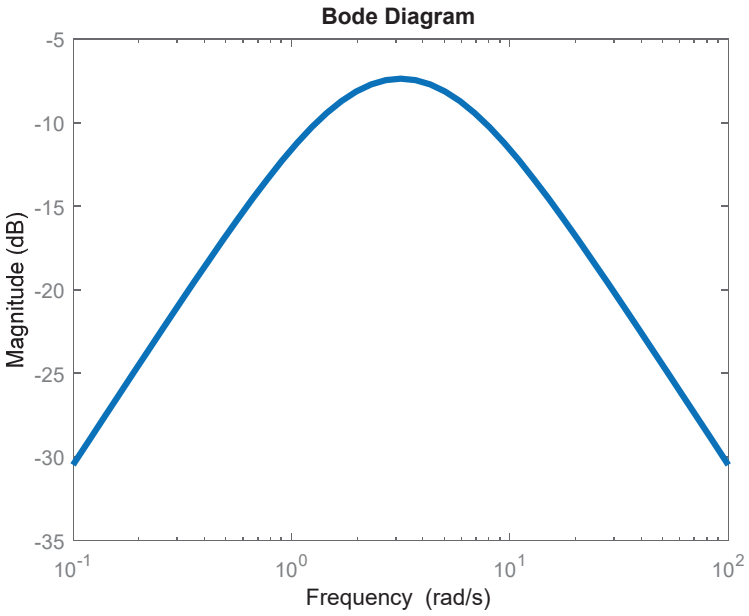
pole @ $s=5$ ↑ ↑ inverted pole @ $s=2$

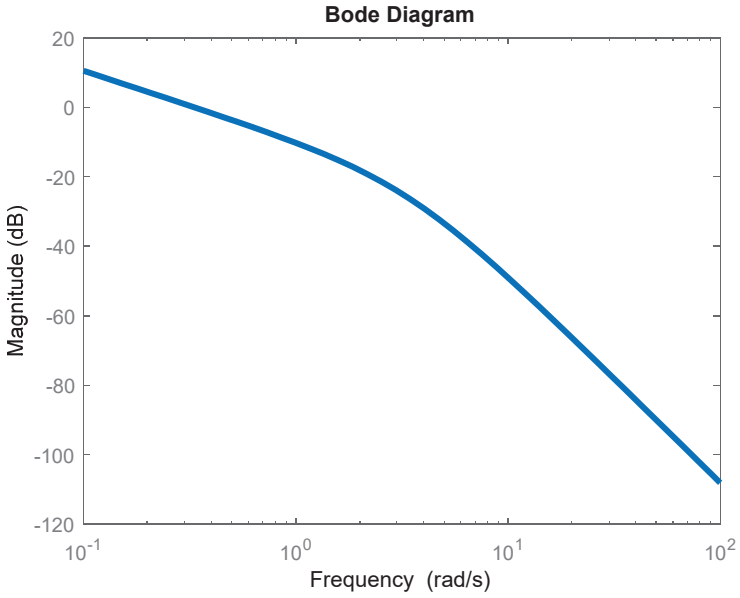
$20\log(3/5) = -4.4\,dB$



b) $\dfrac{4}{5}\dfrac{1}{(s+4)(s+3)}$ → real poles at DC, $\omega = 4$, $\omega = 3$








```
s = tf('s');

Ha = 3*s/(s^2+7*s+10);
Hb = 4/(s^3+7*s^2+12*s);

figure(1)
bodemag(Ha);
set(findall(gcf,'type','line'),'linewidth',3)

figure(2);
bodemag(Hb);
set(findall(gcf,'type','line'),'linewidth',3)
```