**BME 444**
**HW 5 - Due Mar 21, 2023**

1. Calculate the magnitude and phase angle of the following complex numbers:

   A. $13 + 2j$
   B. $-5 - 3j$
   C. $-2.4 + 3.6j$

2. Given the transfer function below, compute the system output for input $u(t) = 30.2\cos(20t)$.

$$G(s) = \frac{2.4}{0.6s^2 + 8s + 36}$$

3. Convert the magnitude of the output waveform from #2 into dB.
4. What is the time shift between the input and output waveforms in #2?
5. Use MATLAB to generate a Bode plot for the transfer function shown in #2.
6. What is the magnitude and phase at a frequency of $\omega = 60$ rad/sec for the transfer function shown in #2?
7. What is the cutoff frequency of the system transfer function shown below?

$$G(s) = \frac{4}{0.2s + 1}$$

8. What is the bandwidth of the system represented by the transfer function in #7?
9. Consider the system shown below. Assume $m = 0.6$ kg, $k = 80$ N/m, $b_1 = 3$ N-s/m, and $b_2 = 0.4$ N-s/m.

   A. Calculate the output of the system if the input is $f_a(t) = 2\sin(8t)$ N.
   B. What input frequency, $\omega$, will cause the largest amplitude of mass displacement?