

## Displacement Response GUI Assignment

The following exercises can be used with the Displacement Response MATLAB GUI to better understand its capabilities and the concepts which it illustrates.

1. What is the initial displacement of the system?
2. Set two parameters and adjust the third to observe the effects on the three plots
3. Set the mass to 5. Adjust damping and/or stiffness to achieve a natural frequency of 3 rad/sec and approximate magnitude of  $10^{-1}$ . Notice the pole locations on the root locus plot and the damping ratio.
4. Set damping to 20. Adjust the mass and/or stiffness to get two real roots as indicated by the root locus plot. Which parameter had a greater effect? What is the critical damping, and how does this relate to the damping of the system?
5. Repeat the above exercise and adjust the mass and/or stiffness to get two repeated roots as indicated by the root locus plot. How do you know that they are indeed two repeated roots?
6. Set the stiffness to 30. Adjust the mass and/or damping to achieve a natural frequency of 1 Hz. Were you able to do this? Adjust the stiffness until the natural frequency is 1 Hz.
7. Set the mass to 5 and the stiffness to 100. Look at the frequency response plot and observe the shape and location of the peak at the natural frequency. Now increase the damping, observe the change in the natural frequency, and compare to the frequency response.
8. Adjust the parameters until the critical damping is approximately 30 lbf-s/in. How does each of the parameters affect the critical damping?