ECE-205 : Circuits and Systems

Homework #3

Due : Tuesday January 5 by 5 PM

1) Problem 3.5 from the Notes

2) Problem 3.6 from the Notes

3) Consider the second order DE representing an underdamped system

$$\ddot{y}(t) + 0.3\dot{y}(t) + 1.5y(t) = 4x(t),\ x(t) = 2u(t),\ y(0) = 0, \dot{y}(0) = -2$$

a. Determine the solution for *t > 0*

b. Determine the time to peak (*hint: n = 2 for a maximum*)
c. Determine the percent overshoot
d. Determine the settling time
e. Estimate the percent overshoot if the system was initially at rest ($y(0) = \dot{y}(0) = 0$,just use the formula)
f. Enter your analytical solution and the system parameters into the program **second_order_driver.m** and simulate the system. The simulation and your analytical solutions should be the same. Be sure to set the final time so the system reaches steady state, but not much longer. *Turn in your plot.*

4) Consider the second order DE representing an underdamped system

$$\ddot{y}(t) + 7.2\dot{y}(t) + 144y(t) = -432x(t),\ x(t) = 2u(t),\ y(0) = 1, \dot{y}(0) = -3$$

a. Determine the solution for *t > 0*

b. Determine the time to peak (*hint: n = 1 for a maximum*)
c. Determine the percent overshoot
d. Determine the settling time
e. Estimate the percent overshoot if the system was initially at rest ($y(0) = \dot{y}(0) = 0$, just use the formula)
g. Enter your analytical solution and the system parameters into the program **second_order_driver.m** and simulate the system. The simulation and your analytical solutions should be the same. Be sure to set the final time so the system reaches steady state, but not much longer. *Turn in your plot.*