EE 3213B  
Homework 2  
Due 1/21/99

1. Solve the following differential equations:
   a) $\ddot{y} + 4y = 5x; \ x(t) = \sin(2t), \ y(0) = 1$
   b) $\ddot{y} + 4\dot{y} + 20y = 2\dot{x} - x; \ x(t) = u(t), \ y(0) = 0, \ \dot{y}(0) = 1$

2. Find the transfer functions of the following systems:
   c) $\dot{y} + 4y = 3x$
   d) $\ddot{y} + 4\dot{y} + 20y = 2\dot{x} - x$
   e) $\dddot{y} - 3\dot{y} + 4y + 8y = 4\dot{x} - 2\dot{x} + x$

3. For the system given below,

   $\dddot{y} + 8\dot{y} + 116y = 116x$

   a) Find the transfer function.
   b) Give the poles and zeros.
   c) Give the general form of the response $y(t)$ to a step input (do not solve explicitly).
   d) Use MATLAB to plot the step response (put your name in the title of the plot).

4. Repeat problem 3 for the system given below. In addition, compare the types of poles of this system to those in problem 3 and use this to explain the resulting behavior seen in the step response plots.

   $\dddot{y} + 8\dot{y} + 12y = 12x$