Homework #4: ECE 461 / 661

1st and 2nd Order Approximations. Due Monday, September 16th

LaPlace Transforms

1) Assume X and Y are related by the following transfer function

$$Y = \left(\frac{7s+2}{(s+2)(s+6)(s+8)} \right) X$$

a) What is the differential equation relating X and Y?

b) Determine y(t) assuming

$$x(t) = 2\cos(5t) + 3\sin(5t)$$

c) Determine y(t) assuming x(t) is a unit step input

2) Assume X and Y are related by the following transfer function:
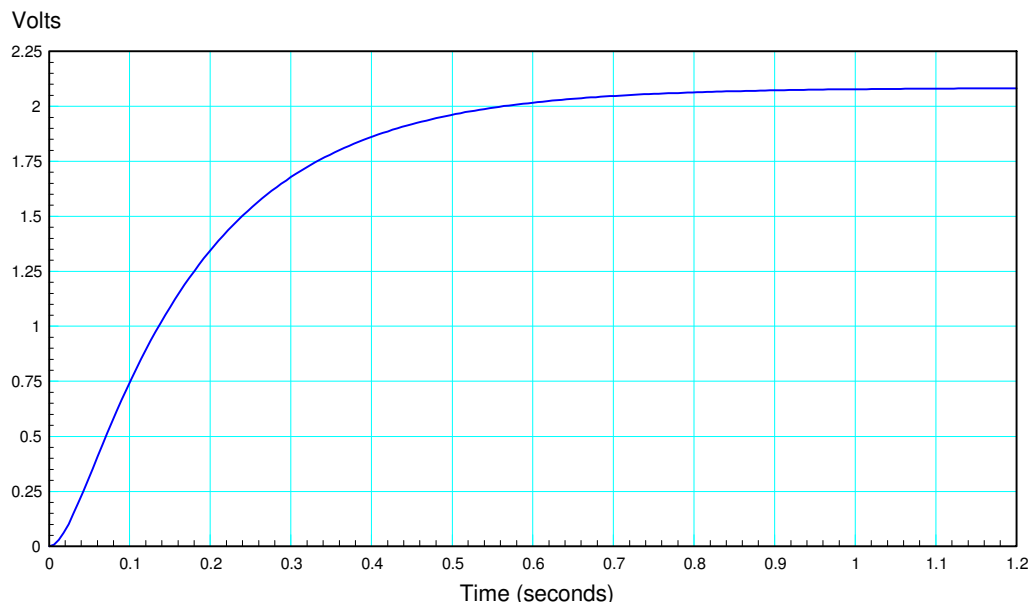
$$Y = \left(\frac{8000}{(s+2+j10)(s+2-j10)(s+50)} \right) X$$

a) Use 2nd-order approximations to determine
   - The 2% settling time
   - The percent overshoot for a step input
   - The steady-state output for a step input (x(t) = u(t))

b) Check your answers using the 3rd order model and Matlab, Simulink, of VisSim (your pick)

3) Determine the transfer function for a system with the following step response:

4) Determine the transfer function for a system with the following step response:

Volts

Time (seconds)