Homework #4: ECE 461 / 661

1st and 2nd Order Approximations. Due Monday, September 12th

LaPlace Transforms (Due September 12th)

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

$$Y = \left(\frac{5(s+2)}{(s+3)(s+4)(s+5)} \right) X$$

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

b) Determine y(t) assuming

$$x(t) = 4\cos(2t) + 3\sin(2t)$$

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

$$x(t) = u(t)$$

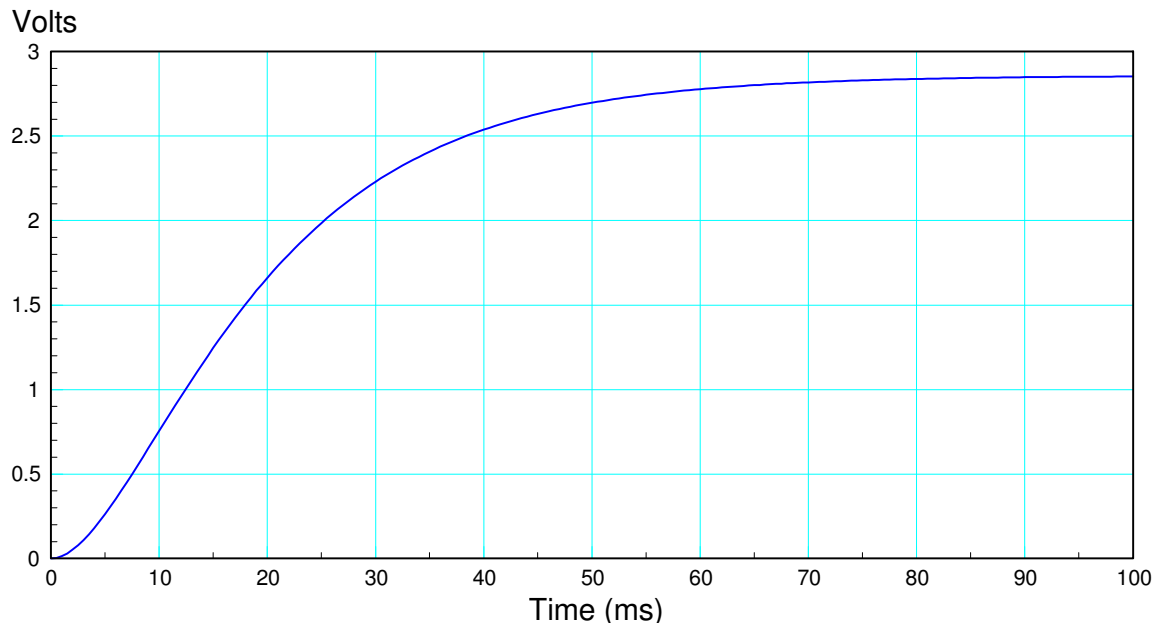2) Assume X and Y are related by the following transfer function:

$$Y = \left(\frac{300}{(s+1+j4)(s+1-j4)(s+15)} \right) X$$

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:

Volts

Time (ms)

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

Volts

Time (ms)