

Homework #4: ECE 461 / 661

1st and 2nd Order Approximations. Due Monday, September 11th

LaPlace Transforms

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

$$Y = \left(\frac{2s+20}{(s+1)(s+3)(s+10)} \right) X$$

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

b) Determine y(t) assuming

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

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

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

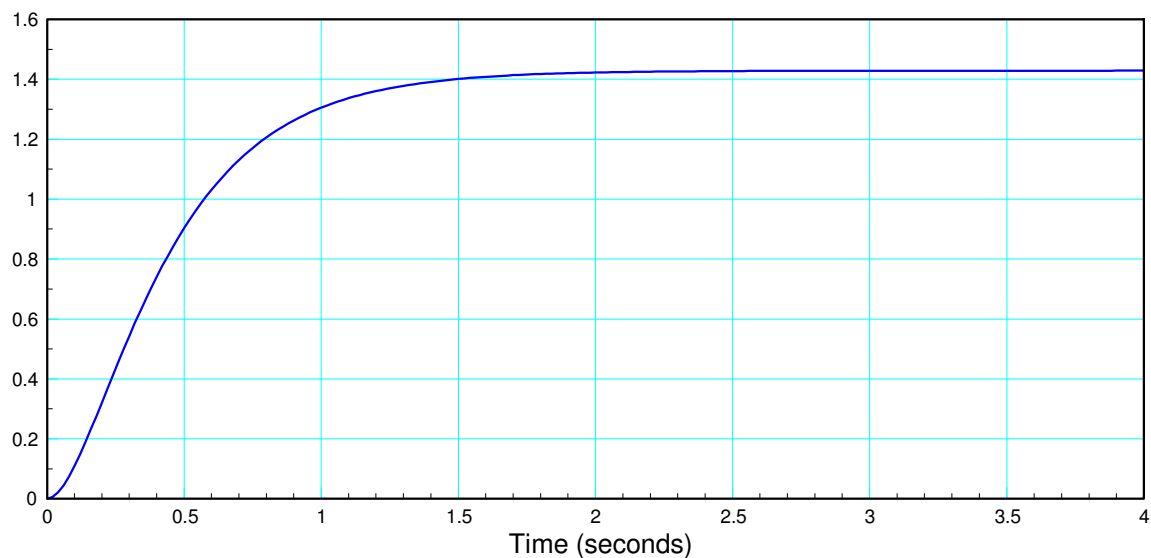
$$Y = \left(\frac{3000}{(s+3+j7)(s+3-j7)(s+30)} \right) X$$

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, or 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:

