1) Estimate the 1st order transfer function of a system with the unit step response shown below.

2) Define the voltage across each of the elements of Figure P4.3 of your text (page 216). Find each of the symbolic transfer functions (in terms of $R_1$, $R_2$, $C$, and $L$): $\frac{E_{R_1}(s)}{V(s)}$, $\frac{E_{R_2}(s)}{V(s)}$, $\frac{E_C(s)}{V(s)}$, and $\frac{E_L(s)}{V(s)}$. Find the numerical values for the damping ratio and natural frequency (or the value of the two system time constants) for this system.

3) Find the damping ratio and natural frequency for each of the transfer functions below.

   a) $G(s) = \frac{20}{s^2 + 2s + 20}$
   
   b) $G(s) = \frac{20}{s^2 + 4s + 20}$
   
   c) $G(s) = \frac{20}{s^2 + 6s + 79}$
   
   d) $G(s) = \frac{20}{s^2 + 6s + 17}$
   
   e) $G(s) = \frac{20}{s^2 + 3.6s + 20}$
   
   f) $G(s) = \frac{20}{s^2 + 7.4s + 20}$
   
   g) $G(s) = \frac{20}{s^2 + 9s + 79}$
   
   h) $G(s) = \frac{20}{s^2 + 2s + 17}$

4) Plot and label the complex pole locations for each of the transfer functions in Problem #2 above. Use a single plot for all 4 sets of poles.