EE 327 Signals and Systems 1
Homework 3

1. Find the output y[n] of the system h[n] to the input x[n]. Use discrete-time convolution.
   a. $x[n]=\{1,2,3\}$ where $n=\{0,1,2\}$ and
      $h[n]=\{1,2,3\}$ where $n=\{0,1,2\}$
   b. $x[n]=10\delta[n+1]+5\delta[n]-5\delta[n-2]-10\delta[n-3]$
      $h[n]=-\delta[n-5]+\delta[n-7]$

2. Perform discrete-time convolution on the following signals and systems. Also perform these convolutions numerically using MATLAB.
   a. $x[n]=5\delta[n]+10\delta[n-1]+15\delta[n-2]+20\delta[n-3]$
      $h[n]=\delta[n]+2\delta[n-1]+3\delta[n-2]+4\delta[n-3]$
   b. $x[n]=-\delta[n+5]-3\delta[n+2]-4\delta[n-1]$
      $h[n]=2\delta[n-100]+4\delta[n-102]$

3. Compute and plot the convolution for each of the pairs of signals.
   a. $v(t)=10e^{-10t}u(t)$ $\quad x(t)=u(t)$
   b. $v(t)=2e^{-2t}u(t)$ $\quad x(t)=u(t)$
   c. Compare parts (a) and (b). Which is the faster response?
   d. $v(t)=2e^{-2t}u(t)$ $\quad x(t)=u(t+1)$
      Do part (d) in two ways – use convolution directly; also, use the time delay property and the solution from (b)

4. Find the output signal, y(t), given
   $h(t)=10e^{-10t}u(t)$ $\quad x(t)=e^{-t}u(t)$

5. Find the output signal, y(t), given
   $h(t)=10e^{-10t}u(t)$ $\quad x(t)=u(t)-u(t-1)$
   Also, perform this convolution numerically using MATLAB and the "conv" function.

6. Find the output signal, y(t), given
   $h(t)=e^{-t}u(t)$ $\quad x(t)=\sin(t)u(t)$

7. Find the output, y(t), given the input, x(t), and the impulse response, h(t), using convolution.