1. Classify or characterize the following systems as to homogeneity, additivity, linearity, time-invariance, BIBO stability, causality, invertibility, and memory.

   (a) $y(t) = x^3(t - 2)$
   (b) $y(t) = x(sin(t))$
   (c) $y[n] = x[n]x[n - 2]$
   (d) $y(t) = t^2 x(t - 1)$
   (e) $y(t) = Od\{x(t)\}$
   (f) $y(t) = x(t - 2) + x(2 - t)$
   (g) $y(t) = [cos(3t)]x(t)$
   (h) $y(t) = x(t/3)$

2. Let

   $x[n] = \begin{cases} 
   1 & 0 \leq n \leq 9 \\
   0 & \text{otherwise} 
   \end{cases}$

   and $h[n] = \begin{cases} 
   1 & 0 \leq n \leq N \\
   0 & \text{otherwise} 
   \end{cases}$

   where $N \leq 9$ is an integer. Determine the value of $N$, given that $y[n] = x[n] * h[n]$ and $y[4] = 5, y[14] = 0$.

3. Consider the cascade interconnection of three causal LTI systems, $x[n] \rightarrow h_1[n] \rightarrow h_2[n] \rightarrow h_2[n] \rightarrow y[n]$. If $h_2[n] = u[n] - u[n - 2]$ and the overall impulse response is $h[n] = \delta[n] + 5\delta[n - 1] + 10\delta[n - 2] + 11\delta[n - 3] + 8\delta[n - 4] + 4\delta[n - 5] + \delta[n - 6]$. 

   (a) Find the impulse response $h_1[n]$

   (b) Find the response of the overall system to the input $x[n] = \delta[n] - \delta[n - 1]$