Digital Signal Processing Assignment # 3

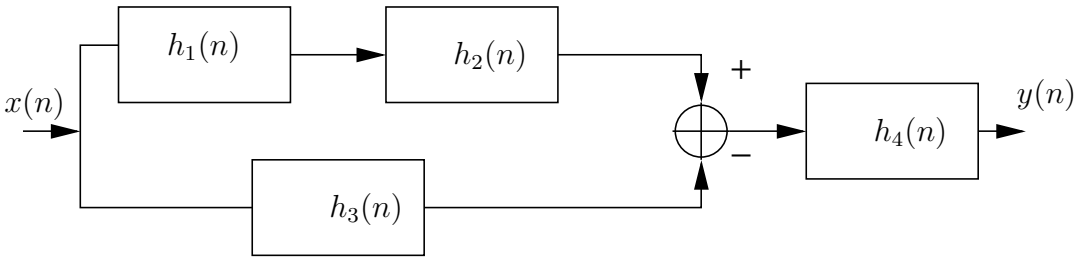
1. For systems with input $x(n)$ and output $y(n)$, find if the following systems are: (i) linear; (ii) time-invariant; (iii) causal.

   (a) $y(n) = \log[x(n)]$
   (b) $y(n) = x(n)x(n-2)$.
   (c) $y(n) = \sum_{k=0}^{n} x(k)$
   (d) $y(n) = \sum_{k=-\infty}^{n} x(k)$

2. For LTI systems with impulse response $h(n)$, find if the following systems are: (i) causal; (ii) BIBO stable.

   (a) $h(n) = \left(\frac{3}{4}\right)^n u(n-1)$
   (b) $h(n) = (2)^n u(-n+1)$

3. Find the impulse response of the following system



   $h_1(n) = \left(\frac{1}{2}\right)^n u(n)$, $h_2(n) = \delta(n)$, $h_3(n) = h_4(n) = \left(\frac{1}{3}\right)^n u(n)$,

4. Draw the simulation diagram of the following LTI system.

   (a) $\frac{1}{3}y(n) - \frac{1}{6}y(n-1) - \frac{1}{4}y(n-2) = x(n) + \frac{1}{2}x(n-2)$
   (b) $h(n) = [2, 1, 4, 5]$