PROBLEM:
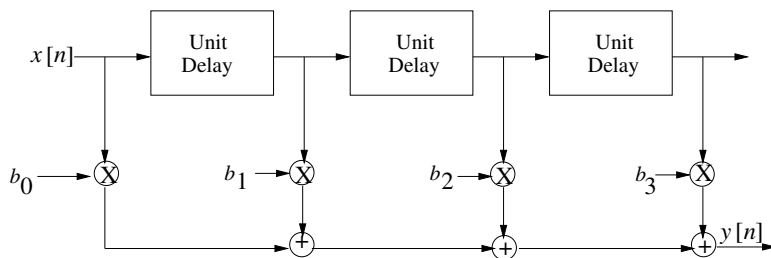
The following problem considers three different discrete-time systems. In each case, the input is $x[n]$ and the output is $y[n]$.

(a) If an LTI system has impulse response $h[n] = \delta[n] + 2\delta[n-1] - \frac{1}{4}\delta[n-2]$, determine the difference equation that relates $x[n]$ and $y[n]$.

$$y[n] = $$

(b) If an LTI system is described by the block diagram below

where $b_0 = 2$, $b_1 = 0$, $b_2 = \frac{1}{3}$, $b_3 = 3$, determine its impulse response $h[n]$.

$$h[n] = $$

(c) If a system is defined by the relation

$$y[n] = (x[n-1])^2 - x[n^2]$$

indicate whether each of the following states is correct by circling yes or no.

i. The system is linear.   Yes or No

ii. The system is time-invariant.   Yes or No

iii. The system is causal.   Yes or No