**PROBLEM:**

Suppose that $S$ is a linear, time-invariant system whose exact form is unknown. It needs to be tested by running some inputs into the system, and then observing the output signals. Suppose that the following input/output pairs are the result of the tests:

\[
\begin{align*}
  x[n] &= \delta[n] - \delta[n - 1] \quad \rightarrow \quad y[n] = 4\delta[n] - 4\delta[n - 4] \\
  x[n] &= \cos(\pi n/2) \quad \rightarrow \quad y[n] = 0 \\
  x[n] &= \cos(\pi n/3) \quad \rightarrow \quad y[n] = 6.93 \cos(\pi n/3 - \pi/2)
\end{align*}
\]

(a) Make a plot of the signal: $x[n] = 4\delta[n] - 4\delta[n - 4]$.

(b) Use linearity and time-invariance to find the output of the system when the input is $x[n] = 3\delta[n] - 3\delta[n - 3]$.

(c) Determine the output when the input is $x[n] = 7 \cos(\pi(n - 2)/3)$.

(d) Determine the output when the input is $x[n] = 9 \sin(\pi n/2)$.