PROBLEM:

Suppose that $\mathcal{S}$ 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:

$$\begin{aligned} x[n] = \delta[n] &\longrightarrow y[n] = \delta[n-1] - \delta[n-5] \\ x[n] = \cos(\pi n/2) &\longrightarrow y[n] = 0 \\ x[n] = \cos(\pi n/4) &\longrightarrow y[n] = 2\cos(\pi n/4 - \pi/4) \end{aligned}$$

(a) Make a plot of the signal: $x[n] = \delta[n] - \delta[n-2] + 2\delta[n-4]$.

(b) What is the output of the system when the input is $x[n] = \delta[n] - \delta[n-2] + 2\delta[n-4]$.

(c) Determine the output when the input is $x[n] = \cos(\pi(n-2)/4)$.

(d) Is the following statement true or false: "$H(\pi/2) = 0$." EXPLAIN