

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:

$$x[n] = \delta[n] \quad \longrightarrow \quad y[n] = \delta[n] - \delta[n - 3]$$

$$x[n] = \cos(2\pi n/3) \quad \longrightarrow \quad y[n] = 0$$

$$x[n] = \cos(\pi n/3 + \pi/2) \quad \longrightarrow \quad y[n] = 2 \cos(\pi n/3 + \pi/2)$$

- Make a plot of the signal: $x[n] = 3\delta[n] - 2\delta[n - 2] + \delta[n - 3]$.
- What is the output of the system when the input is $x[n] = 3\delta[n] - 2\delta[n - 2] + \delta[n - 3]$.
- Determine the output when the input is $x[n] = \cos(\pi(n - 3)/3)$.
- Is the following statement true or false: “ $H(\pi/2) = 0$.” EXPLAIN