

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 pair is the result of such a test:

$$x[n] = 7 \cos(\pi n/4 - \pi/3) \quad \longrightarrow \quad y[n] = \sqrt{3} \cos(\pi n/4)$$

Use linearity and time-invariance to find the output when the input $x[n]$ is

$$x[n] = 4 \cos(\pi (n - 9)/4)$$