

Assignment #1 CE242 : Signals & Systems
Dept. of Computer Engineering
Sharif University of Technology
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1) Determine which of the properties (linearity, time invariance, stability, & causality) hold for each of the following systems.

a) $y(t) = \int_{-\infty}^t e^{-(t-\tau)} x(\tau) d\tau$

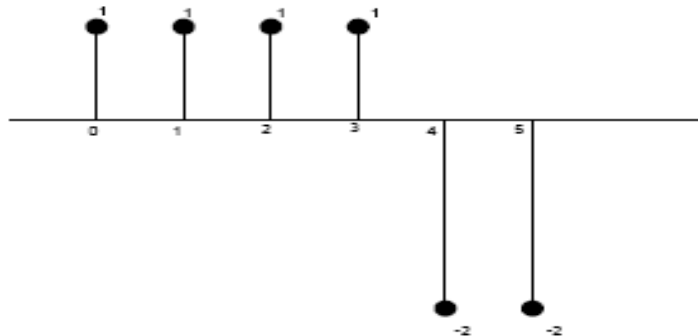
b) $y[n] = \sum_{k=-\infty}^n \left(\frac{1}{2}\right)^{n-k} x[k]$

c) $y(t) = \begin{cases} 0 & t < 0 \\ x(t) + x(t-2) & t \geq 0 \end{cases}$

d) $y[n] = x[4n+1]$

e) $y[n] = nx[n]$

2) Consider a discrete time system which is linear and time invariant. The response of this system to the unit impulse signal ($\delta[n]$) is shown below.



- a) What is the response of this system to: $x_1[n] = \delta[n] + \delta[n-1]$.
- b) What is the response of this system to: $x_2[n] = u[n]$ (unit step response).

3) The system L in the next page figure is known to be linear. Shown are three input signals and their corresponding output signals.

- a) Is it possible to find the output of this system to $\delta[n]$. If yes, find it.
- b) What can you say about the causality of this system?
- c) Is this system time invariant or not?

