EE3210 Signals and Systems

Tutorial 3

Problem 1: Consider the discrete-time system whose input $x[n]$ and output $y[n]$ are related by

$$y[n] = x[2n].$$

Determine which of the following properties hold for this system:

(a) Causal

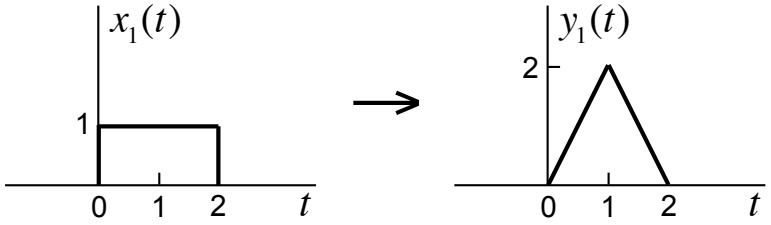
(b) Stable

(c) Time invariant

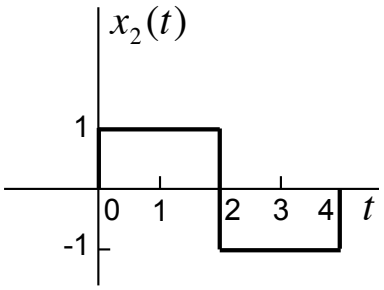
(d) Linear

Justify your answers.

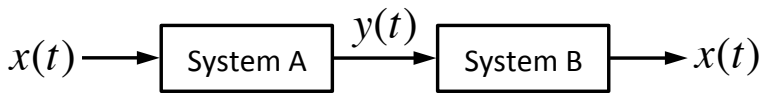
Problem 2: Consider an LTI system whose response to the signal $x_1(t)$ is the signal $y_1(t)$, as shown in the figure below.



Determine and sketch the response of the system to the input $x_2(t)$ shown in the figure below.



Problem 3: Consider the cascade of two systems shown in the figure below. The first system, A, is known to be an LTI system. The second system, B, is known to be the inverse of system A. Let $y_1(t)$ denote the response of system A to $x_1(t)$, and let $y_2(t)$ denote the response of system A to $x_2(t)$.



(a) What is the response of system B to the input $ay_1(t) + by_2(t)$, where a and b are constants?

(b) What is the response of system B to the input $y_1(t - t_0)$?

(c) Show that system B is an LTI system.