EE3210 Signals and Systems

Tutorial 4

Problem 1: Consider a system S with input $x[n]$ and output $y[n]$. This system is obtained through a series interconnection of a system S_1 followed by a system S_2. The input-output relationships for S_1 and S_2 are

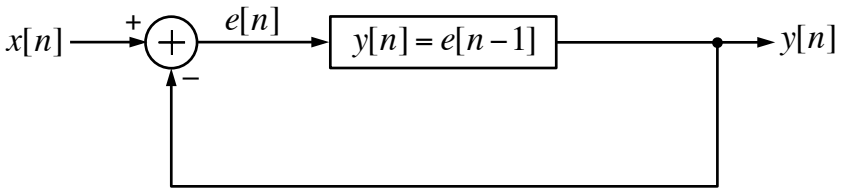
$$S_1: \quad y_1[n] = 2x_1[n] + 4x_1[n-1]$$
$$S_2: \quad y_2[n] = x_2[n-2] + \tfrac{1}{2}x_2[n-3]$$

where $x_1[n]$ and $x_2[n]$ denote input signals.

(a) Determine the input-output relationship for system S.

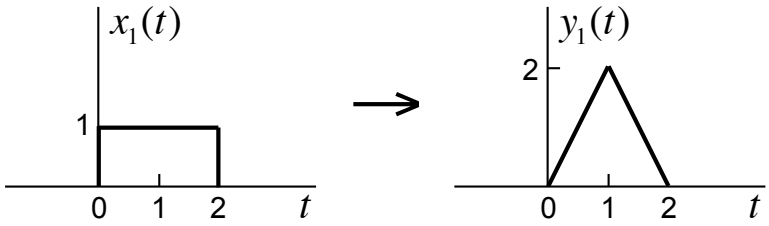
(b) Does the input-output relationship of system S change if the order in which S_1 and S_2 are connected in series is reversed (i.e., if S_2 is followed by S_1)?

Problem 2: Consider the feedback system shown in the figure below.



Assume that $y[n] = 0$ for $n < 0$. Sketch the output when $x[n] = \delta[n]$.

Problem 3: Consider a linear and time-invariant system whose response to the signal $x_1(t)$ as shown in the figure below 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.