Student Name:

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Chapter 1-2

1. A continuous-time signal x(t) is shown in Figure 1, sketch and label carefully each of the following signal

   (a) (b) $x(2t+1)$ (c) $[x(t)+x(-t)]u(t)$

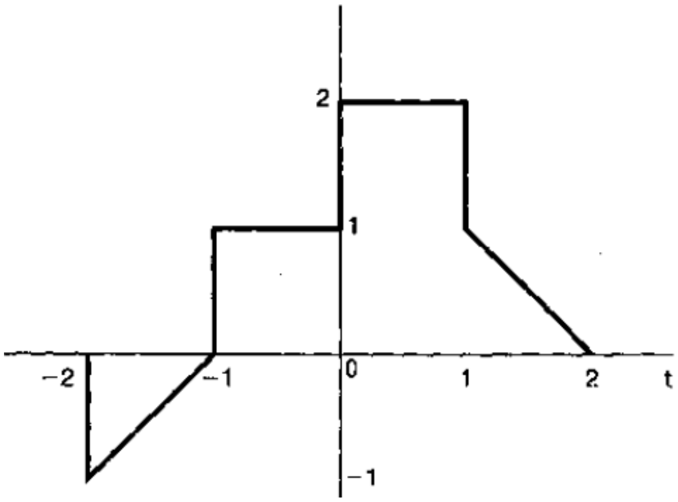

Figure 1

2. A discrete-time signal is shown in Fig. 2, Sketch and label carefully each of the following signals.

   (a) $x[n-4]$ (b) $x[3n]$ (c) $x[n]u[3-n]$ (d) $\frac{1}{2}x[n]+\frac{1}{2}(-1)^n x[n]$

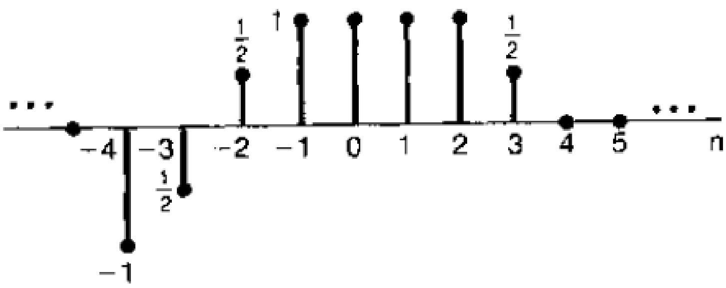

Figure 2

3. Determine and sketch the even and odd parts of the signals depicted in Fig. 3. Label your sketches carefully.

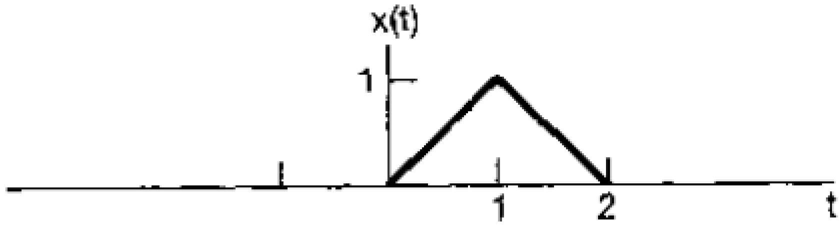

Fig. 3

4. Determine and sketch the even and odd parts of the signals depicted in Fig. 4. Label your sketches carefully.

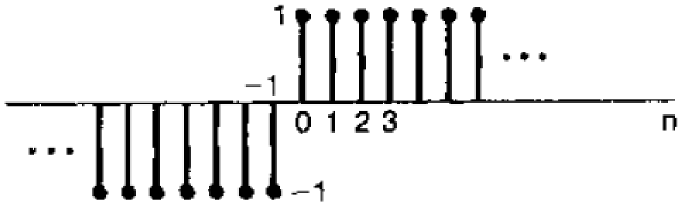

Fig. 4

5. In this chapter, we introduce a number of general properties if systems. In particular, a system may or may not be (a) Memoryless (b) Time invariant (c) Linear (d) Causal (d) Stable. Determine which of these properties hold and which do not hold for each of the following continuous-time systems. Justify your answers. In each example, y(t) denotes the system output and x(t) is the system input.

(a) $y(t) = x(t-2) + x(2-t)$ (b) $y(t) = \int_{-\infty}^{2t} x(\tau) d\tau$

(c) $y(t) = \begin{cases} 0, & x(t) < 0 \\ x(t) + x(t-2), & x(t) \geq 0 \end{cases}$ (d) $y(t) = x(t/3)$

6. Determine which of the properties listed in Problem 1.27 hold and which do not hold for each of the following discrete-time system. Justify your answers. In this example, y[n] denotes the system output and x[n] is the system input.

(a) $y[n] = x[n-2] - 2x[n-8]$ (b) $y(t) = nx[n]$

(c) $y[n] = \begin{cases} x[n], & n \geq 1 \\ 0, & n = 0 \\ x[n+1], & n \leq -1 \end{cases}$ (d) $y[n] = x[4n+1]$

7. In this problem, we illustrate one of the most important consequences of the proposed of the proposed linearity and time invariant. Specifically, once we know the response of a linear system or a linear time-invariant (LTI) system to a single input of the responses to several inputs, we can directly compute the responses to many other input signals. Much of remainder of this book deals with a through exploitation of this fact in order to develop results and techniques for analyzing and synthesizing LTI systems.

(a) Consider an LTI system whose response to the signal $x_1(t)$ in Fig. 5 (a) is signal $y_1(t)$

illustrated in Fig. 5 (b). Determine the sketch carefully the response of the system to the input $x_2(t)$ depicted in Fig. 5 (c).

(b) Determine and sketch the response of the system considered in part (a) to the input $x_3(t)$ shown in Fig. 5 (d).

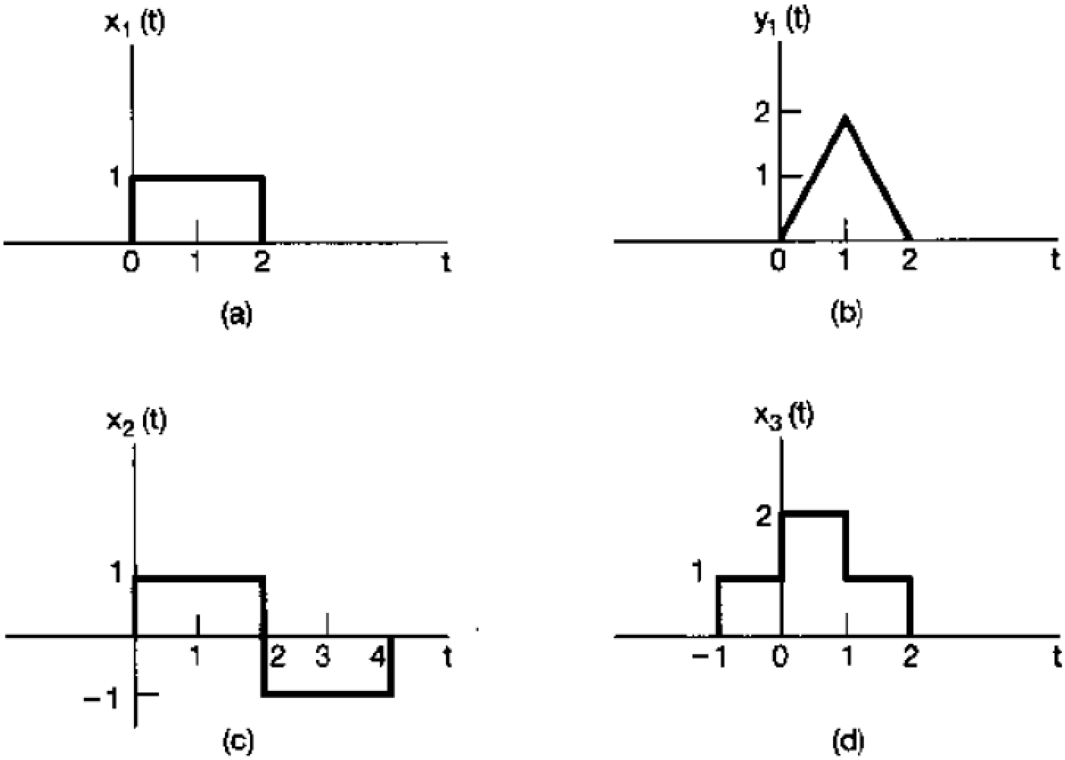

Fig. 5