
ECE250: Signals and Systems

Practice Sheet 1

1. Sketch the following signals (CO1)

- (a) $u(-t + 3)$
- (b) $-2u(t + 3)$
- (c) $-5r(t)$
- (d) $2r(t - 3)$

where,

$$u(t) = \begin{cases} 1 & \text{for } t \geq 0 \\ 0 & \text{for } t < 0 \end{cases}$$

$$r(t) = \begin{cases} t & \text{for } t \geq 0 \\ 0 & \text{for } t < 0 \end{cases}$$

2. For the signal $x(t)$ shown in Figure 1, sketch the signals (CO1)

- (a) $x(t - 4)$ and $x(t + 4)$
- (b) $x(\frac{4}{3}t)$ and $x(\frac{3}{4}t)$

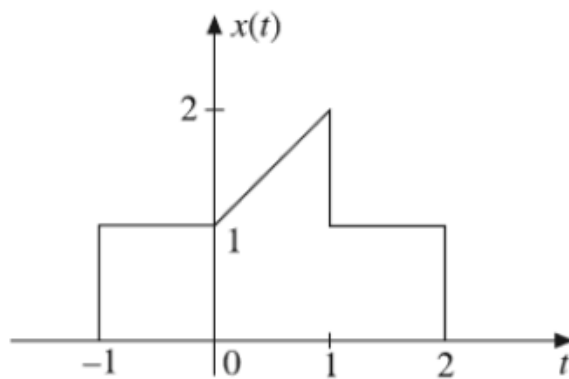


Figure 1: Signal for Problem 2

3. A unit rectangular function is as follows: (CO1)

$$x(t) = \begin{cases} 1 & \text{for } |t| \leq \frac{1}{2} \\ 0 & \text{for } |t| > \frac{1}{2} \end{cases}$$

Plot

- (a) $x(t)$
- (b) $3x(\frac{t+1}{4})$

(c) $-4x(-t)$

4. A continuous-time signal is shown in the figure. Sketch the following signal.

- (a) $x(t - 1)$
 (b) $x(2t + 1)$
 (c) $x(4 - t/2)$

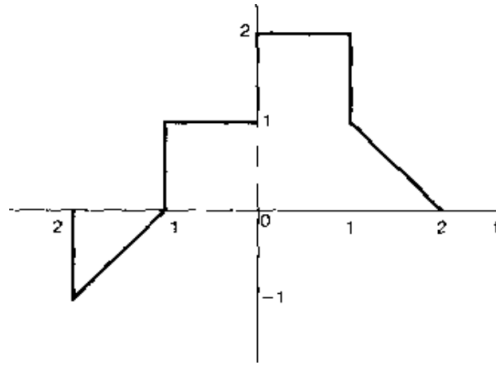


Figure 2: Signals for Problem 4

5. Sketch the following signal (CO1)

- (a) $x(t) = A[u(t + a) - u(t - a)]$ for $a > 0$
 (b) $x(t) = e^{-a|t|}$ for $a > 0$

where,

$$u(t) = \begin{cases} 1 & \text{for } t \geq 0 \\ 0 & \text{for } t < 0 \end{cases}$$

Also, determine whether the given signal is a power signal or an energy signal or neither.

6. Determine whether the following signals are energy signals or power signals and calculate their energy or power: (CO1)

- (a) $x(t) = \sin^2 \omega_0 t$
 (b) $x(t) = tu(t)$
 (c) $x(t) = e^{j[3t + (\pi/2)]}$

where,

$$u(t) = \begin{cases} 1 & \text{for } t \geq 0 \\ 0 & \text{for } t < 0 \end{cases}$$

7. Find the energy of the signals shown in Figure 2. (CO1)

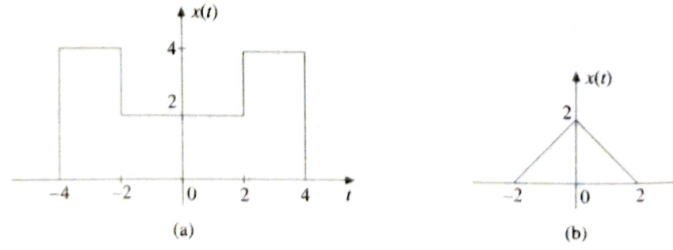


Figure 3: Signals for Problem 7

8. Examine whether the following continuous time signals are periodic or not? If the signal is periodic, determine the fundamental time period. (CO1)

- (a) $e^{j5\pi t}$
- (b) $\sin(10\pi t) + \cos(20\pi t)$
- (c) $3u(t) + 2\sin(2t)$
- (d) $e^{-|t|}$

where,

$$u(t) = \begin{cases} 1 & \text{for } t \geq 0 \\ 0 & \text{for } t < 0 \end{cases}$$

9. Determine whether the following discrete-time signals are periodic or not? If periodic, determine the fundamental period. (CO1)

- (a) $\sin(0.02\pi n)$
- (b) $\cos(\frac{\pi}{2} + 0.3n)$
- (c) $1 + e^{j2\pi n/3} - e^{j4\pi n/7}$

10. Let $x(t)$ be a signal with $x(t) = 0, t < 3$. For each signal given below, determine the values of t for which the signal is guaranteed to be 0: (CO1)

- (a) $x(1 - t)$
- (c) $x(3t)$
- (d) $x(2 - \frac{t}{3})$

11. Find whether the following signals are even or odd. (CO1)

- (a) $x(t) = e^{-3t}$
- (b) $x(t) = 3e^{j4\pi t}$
- (c) $x(t) = u(t + 4) - u(t - 2)$

where,

$$u(t) = \begin{cases} 1 & \text{for } t \geq 0 \\ 0 & \text{for } t < 0 \end{cases}$$

12. Find and sketch the even and odd components of the following signal: (CO1)

$$x(t) = \begin{cases} t & 0 \leq t \leq 1 \\ 2 - t & 1 \leq t \leq 2 \end{cases}$$