

EC2102 Networks and Systems – HW 1
August 1, 2013

1. Carefully sketch the following signals. Mark all the critical points.

(a) $g(t) = tu(-t - 1) - u(-t - 1)$

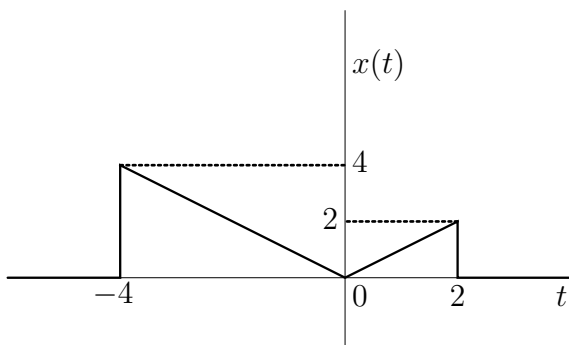
(b) $h(t) = e^{-tu(t)}, \quad -1 \leq t \leq 1$

2. Given a continuous-time signal specified by

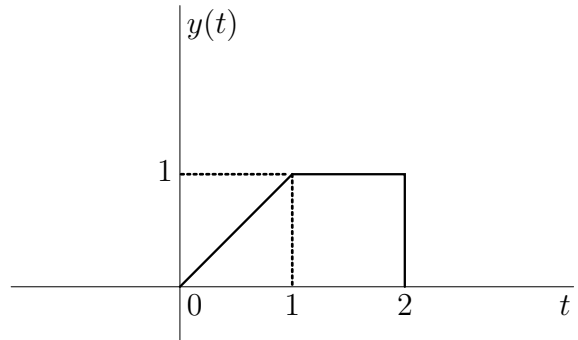
$$x(t) = \begin{cases} 1 - |t|, & -1 \leq t \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

plot the discrete-time sequence that results from uniform sampling of $x(t)$ for the following sampling intervals: (a) 0.25 s, (b) 0.5 s, and (c) 1 s.

3. For the signal $x(t)$ illustrated below, sketch (a) $x(t-4)$, (b) $x(t/1.5)$, (c) $x(-t)$, (d) $x(2t - 4)$, and (e) $x(2 - t)$.



4. Consider the signal $y(t) = (1/5)x(-2t - 3)$ shown below. Determine and carefully sketch the original signal $x(t)$. Determine and carefully sketch $y_o(t)$, the odd portion of $y(t)$.



5. Identify the complex frequencies in the following signals: (a) $\cos 3t$, (b) $e^{-3t} \cos 3t$, (c) $e^{2t} \cos 3t$, (d) e^{-2t} , (e) e^{2t} , and (f) 5.

6. The unit pulse function $\Pi : R \rightarrow R$ is defined as

$$\Pi(t) = \begin{cases} 1, & -\frac{1}{2} \leq t \leq \frac{1}{2} \\ 0, & \text{otherwise} \end{cases}$$

Sketch the following signals and evaluate the energy of each one of them

- (a) $\Pi(2t)$.
 (b) $6\Pi(0.5t)$.
 (c) $\Pi(t - 4)$.
 (d) $\Pi(\frac{2-t}{2})$.
 (e) $\Pi(\frac{t+1}{2}) + \Pi(t - 1)$.

7. Determine which of the following signals is periodic. If a signal is periodic, what is the fundamental period and average power?

- (a) $\cos(\pi t)$.
 (b) $A \sin(10\pi t)$.
 (c) $\sin(\sqrt{3}\pi t)$.
 (d) e^{jt} .
 (e) $A \sin(4\pi t + \pi)$.
 (f) $\sum_{n=-\infty}^{\infty} \Pi(t - \frac{n}{5})$.
 (g) $\sum_{n=-\infty}^{\infty} \Pi(t - 2n)$.