

EEE 3005 Signals and Systems Laboratory - Experiment - 1

1. Use MATLAB to plot the following functions for $-1 \leq t \leq 5$ sec. Label your axes appropriately.

- (a) $u(t)$
- (b) $r(t)$
- (c) $x(t) = 3e^{-2t}u(t)$
- (d) $x(t) = \begin{cases} e^{-t}, & 0 \leq t \leq 2, \\ 0, & \text{otherwise} \end{cases}$
- (e) $x(t) = \sin(2t) + 2 \cos(3t - 0.2)$
- (f) $x(t) = p_2(t)$, where $p_\tau(t)$ is the rectangular pulse of width τ
- (g) $x(t) = e^{2t} \sin(3t)u(t)$
- (h) $x(t) = e^{-2t} \sin(3t)u(t)$

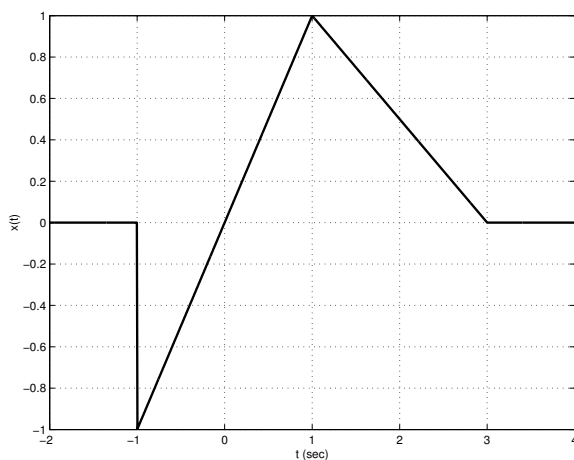
2. Sketch the continuous-time signals in parts (a) to (d).

- (a) $x(t) = u(t+1) - 2u(t-1) + u(t-3)$
- (b) $x(t) = (t+1)u(t-1) - tu(t) - u(t-2)$
- (c) $x(t) = e^{-t}u(t) + e^{-t}[\exp(2t-4) - 1]u(t-2) - e^{t-4}u(t-4)$
- (d) $x(t) = \cos t \cdot [u(t + \frac{\pi}{2}) - 2u(t - \pi)] + (\cos t)u(t - \frac{3\pi}{2})$
- (e) Use MATLAB to plot the signals defined in parts (a) to (d).

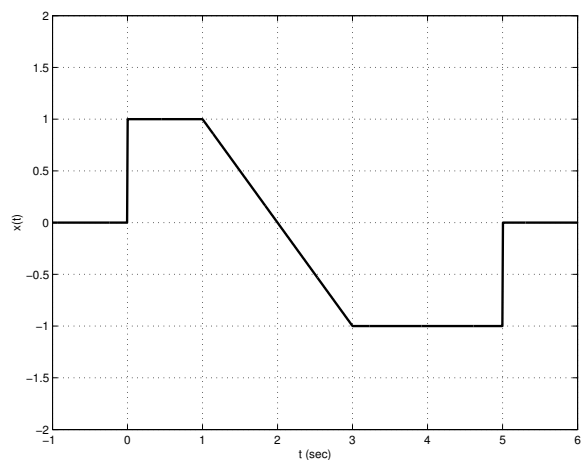
3. Express each continuous-time signal shown below in the form

$$x(t) = f_1(t)u(t - t_1) + f_2(t)u(t - t_2) + \dots$$

while giving signals $f_1(t)$, $f_2(t)$, ... in the simplest possible analytical form.

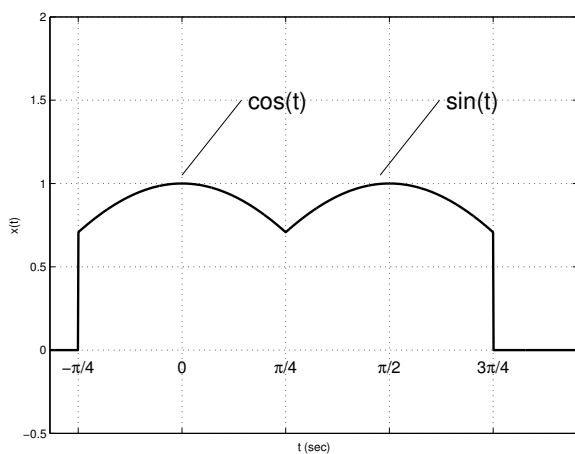


(a)

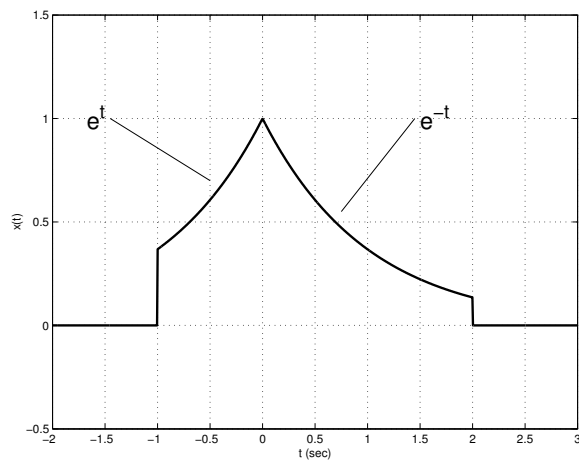


(b)

(over)



(c)



(d)

4. Plot the following discrete-time signals using MATLAB for $-5 \leq n \leq 15$. Label your axes appropriately. *Hint*: use the `stem` command.

- (a) $u[n]$
- (b) $r[n]$
- (c) $x[n] = (0.8)^n u[n]$
- (d) $x[n] = (-0.8)^n u[n]$
- (e) $x[n] = \sin\left(\frac{\pi n}{4}\right)$
- (f) $x[n] = \sin\left(\frac{\pi n}{2}\right)$
- (g) $x[n] = (0.9)^n \left[\sin\left(\frac{\pi n}{4}\right) + \cos\left(\frac{\pi n}{4}\right) \right]$
- (h) $x[n] = 2^n u[n]$
- (i) $x[n] = \begin{cases} 1, & -4 \leq n \leq 4, \\ 0, & \text{else} \end{cases}$

5. Sketch the following discrete-time signals

- (a) $x[n] = u[n] - 2u[n-1] + u[n-4]$
- (b) $x[n] = (n+2)u[n+2] - 2u[n] - nu[n-4]$
- (c) $x[n] = \delta[n+1] - \delta[n] + u[n+1] - u[n-2]$
- (d) $x[n] = e^{0.2n}u[n+1] + u[n] - 2e^{0.1n}u[n-3] - (1 - e^{0.1n})^2 u[n-5]$
- (e) Use MATLAB to plot the signals defined in parts (a) to (d).