**Tutorial 1**

1. How is the unit step function $u(t)$ related to (i) $\delta(t)$ and (ii) ramp function $r(t)$?

2. For a signal $x(t) = 3u(t) - u(t\text{-}2)$, sketch and label

(i) $x(t)$ (ii) $\frac{dx(t)}{dt}$ (iii) $x(2t)$ (iv) $x(t/2)$ (v) $x(1\text{-}t)$

3. For $x(t) = u(t\text{+}2) - 2u(t) + u(t\text{-}1)$, sketch and label

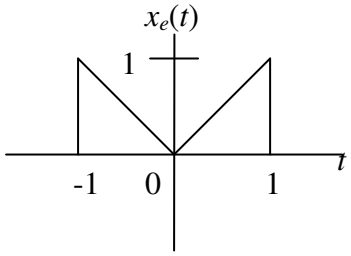
(i) $x(t)$ (ii) $\int_{-\infty}^{t} x(\tau)d\tau$

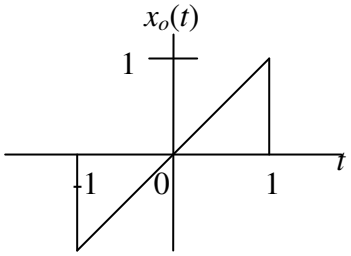
4. For $x(t) = \delta(t\text{+}3) - 2\delta(t\text{-}3)$, sketch and label

(i) $x(t)$ (ii) $\int_{-\infty}^{t} x(\tau)d\tau$

5. Sketch and label $x(t) = e^{-t}u(t) + e^{-t}u(t\text{-}2) + e^{t\text{-}4}u(t\text{-}4)$.

6. Find the signal that has an even and an odd component shown below.



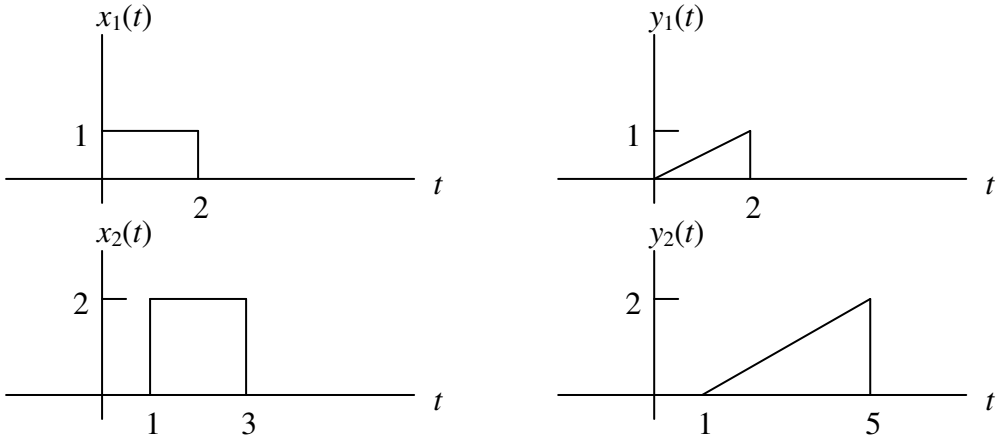




7. Consider a sinusoidal signal $x(t) = A\cos(\omega t)$. Determine the average value, the average power and the root mean square of $x(t)$.

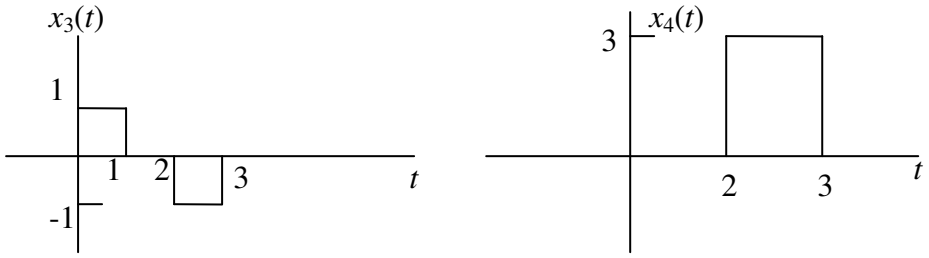
8. Are the following systems with or without memory, causal or noncausal?
(i) $y(t) = 2u(t)$ (ii) y(t) = sin($u(t)$) (iii) $y(t) = \sin(u(t\text{+}1))$ (iv)y(t)=$e^{t\text{-}2}.u(t\text{-}2)$

9. Is the system represented by $y(t) = 1/x(t)$ linear and time-invariant?

10. Consider a linear system with an input-output pairs shown below.




(i) Is the system time invariant? Can we compute the response to the inputs $x_3(t)$ and $x_4(t)$?




(ii) If $y_1(t)$ is the response of another system that is linear time-invariant when the input is $x_1(t)$, find the system response to a unit step function.