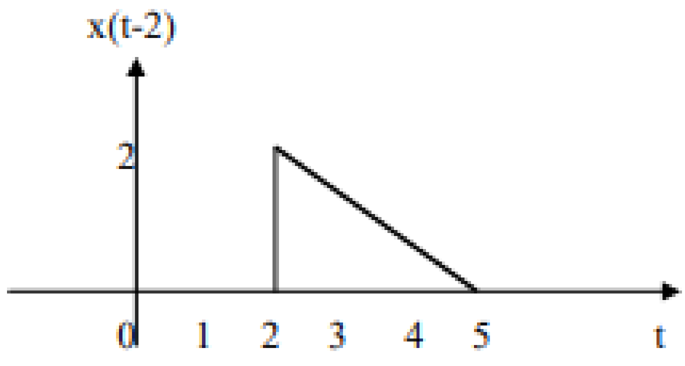
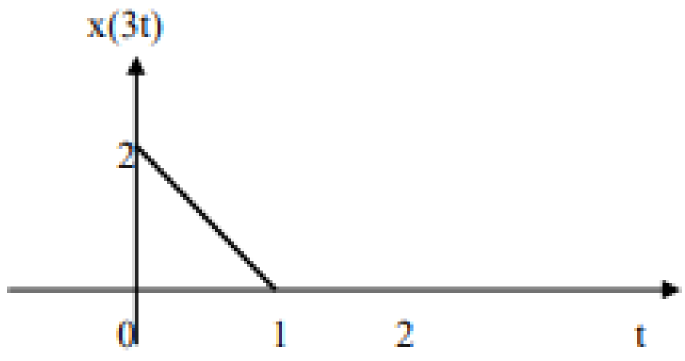
Prob. 1.24

(a)x(t-2) is the delayed version of x(t) by 2s. It is sketched below.



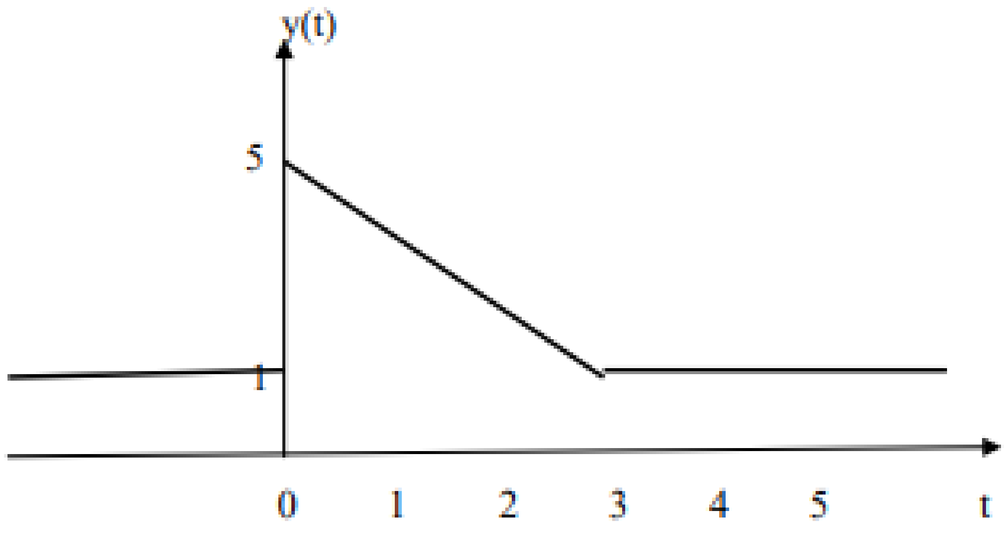
(b)x(3t) is the compressed form of x(t) and is shown below.



(c) $x(t) = \begin{cases} 2 - \frac{2}{3}t, & 0 < t < 3 \\ 0, & \text{otherwise} \end{cases}$

$$y(t) = 1 + 2x(t) == \begin{cases} 5 - \frac{4}{3}t, & 0 < t < 3 \\ 1, & \text{otherwise} \end{cases}$$

y(t) is sketched below.



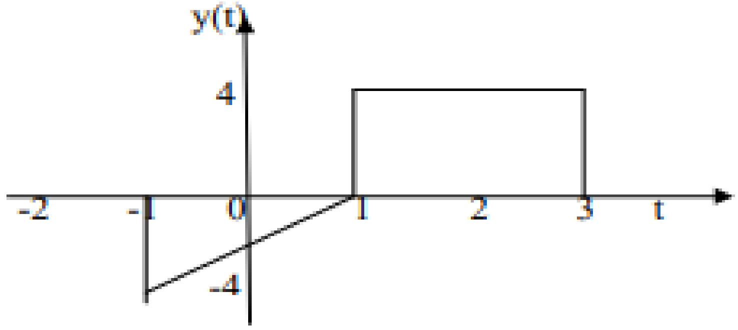
Prob. 1.29

(a) $x(t)=\begin{cases}-2t, & -2<t<0\\ -4, & 0<t<2\end{cases}$

$$x(t-1)=\begin{cases}-2(t-1), & -2<t-1<0\\ -4, & 0<t-1<2\end{cases}=\begin{cases}-2t+2, & -1<t<1\\ -4, & 1<t<3\end{cases}$$

$$y(t)=-x(t-1)=\begin{cases}2t-2, & -1<t<1\\ 4, & 1<t<3\end{cases}$$

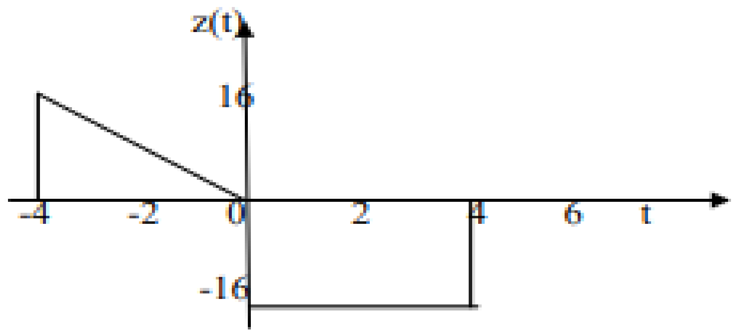
which is sketched below.



(b) $x(t/2)=\begin{cases}-2(t/2), & -2<t/2<0\\ -4, & 0<t/2<2\end{cases}=\begin{cases}-t, & -4<t<0\\ -4, & 0<t<4\end{cases}$

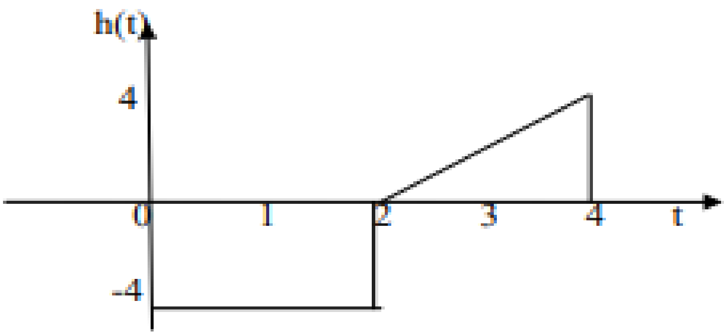
$$z(t)=4x(t/2)=\begin{cases}-4t, & -4<t<0\\ -16, & 0<t<4\end{cases}$$

which is sketched below.



(c) $h(t)=x(2-t)=\begin{cases}-2(2-t), & -2<2-t<0\\ -4, & 0<2-t<2\end{cases}=\begin{cases}-4+2t, & 2<t<4\\ -4, & 0<t<2\end{cases}$

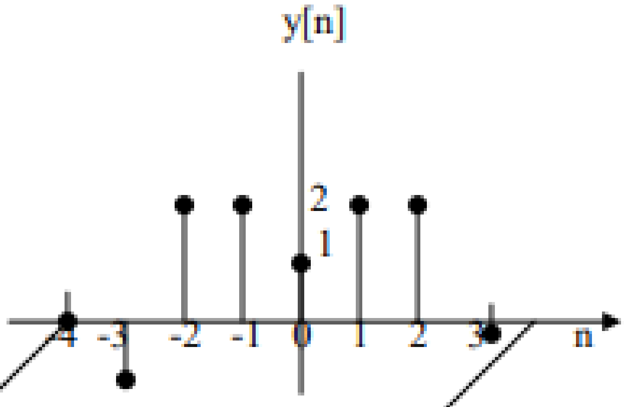
which is sketched below.



Prob. 1.32

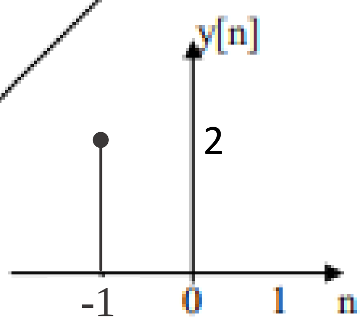
(a) $u[2-n]=\begin{cases}1, & n\le 2\\ 0, & n>2\end{cases}$

and $y[n]=x[n]u[2-n]$ is sketched below.



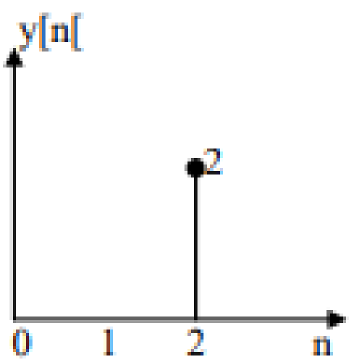
(b) $u[n+1]-u[n]=\begin{cases}1, & n=-1\\ 0, & \text{otherwise}\end{cases}$

and $y[n]=x[n](u[n+1]-u[n])$ is sketched below.



(c) Let $y[n]=x[n]\delta[n-2]=x[2]\delta[n-2]=2\delta[n-2]=\begin{cases}2, & n=2\\ 0, & n\neq 2\end{cases}$

which is sketched below.



Prob. 1.36

(a) $y(t) = \exp[Ax_1(t) + Bx_2(t)] = \exp[Ax_1(t)]\exp[Bx_2(t)]$

$\neq Ay_1(t) + By_2(t)$

The system characterized by the given equatio is nonlinear

(b) Since $\cos[x_1(t) + x_2(t)] \neq \cos x_1(t) + \cos x_2(t),$

the system is nonlinear.

(c) $y_1 = t^2 x_1, \quad y_2 = t^2 x_2$

$$k_1 y_1 + k_2 y_2 = t^2 (k_1 x_1 + k_2 x_2) \longrightarrow y = t^2 x$$

where y=$k_1 y_1 + k_2 y_2$ and $x = k_1 x_1 + k_2 x_2$. Thus superposition holds and the system is linear.

Prob. 1.39

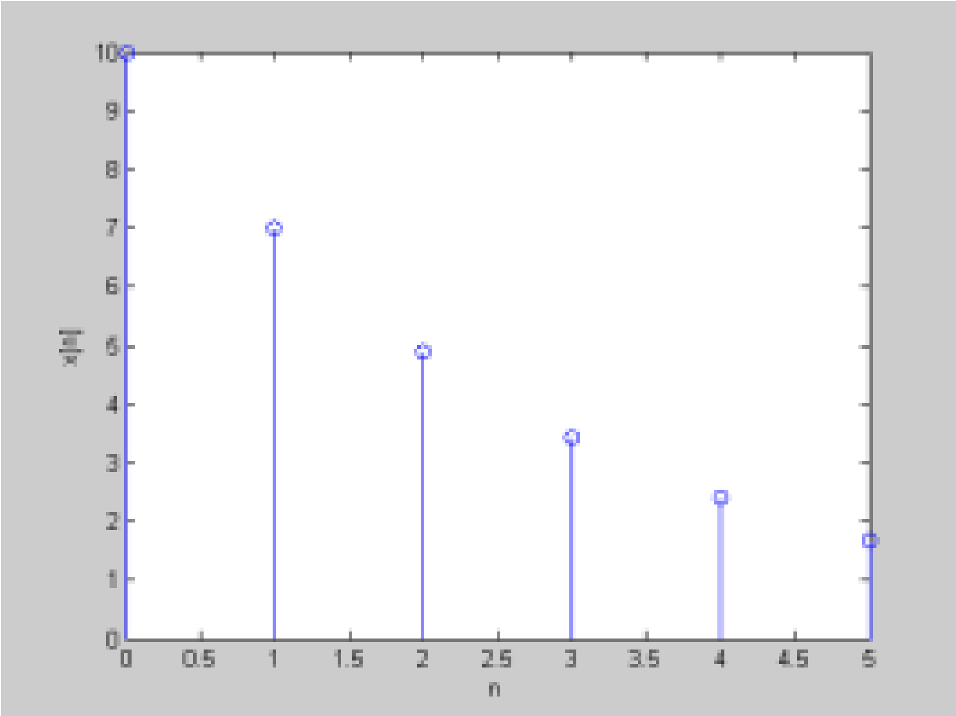
(a) Causal and memoryless since y(t) depends only on x(t) at time t.

(b) Causal and memory since $y(t)$ depends on $x(\tau)$ for $0 < \tau < t$

Prob. 1.49

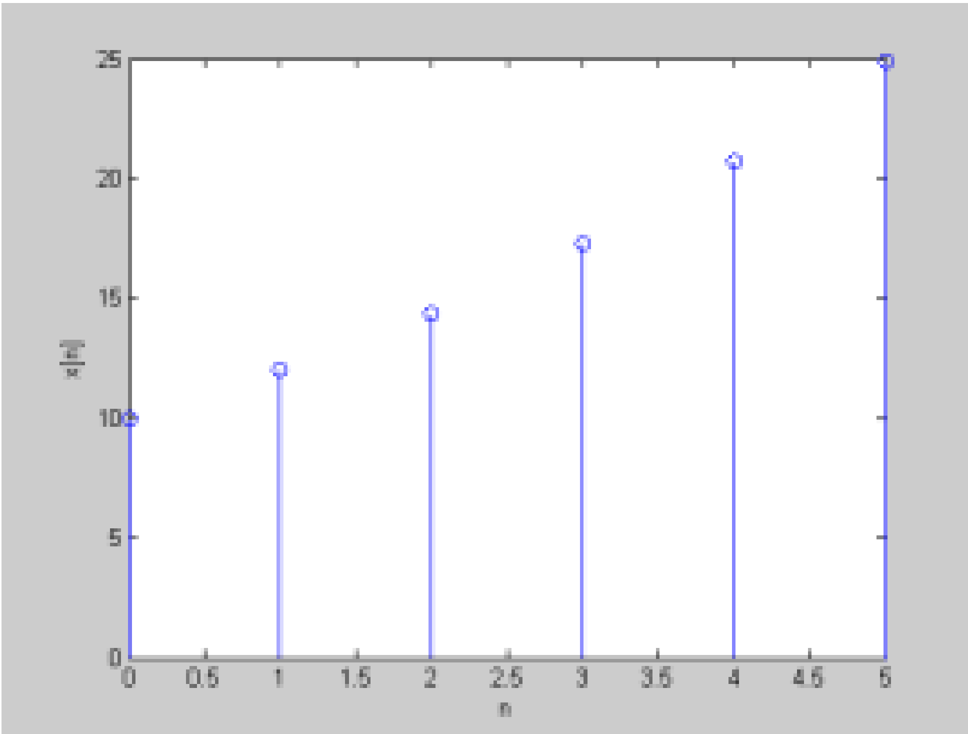
(a) The MATLAB code and the plot are provided below.

```
n = 0:1:5;
x=10*(0.7).^n;
stem(n,x);
xlabel('n')
ylabel('x[n]')
```



(b) The MATLAB code and the plot are provided below.

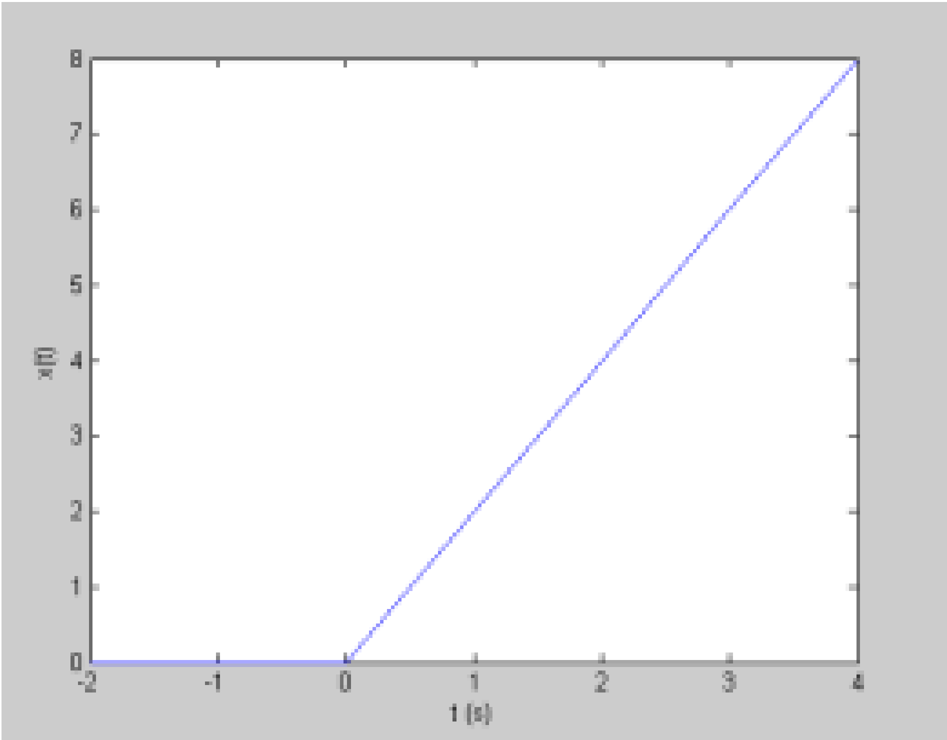
```
n = 0:1:5;
x=10*(1.2).^n;
stem(n,x);
xlabel('n')
ylabel('x[n]')
```



Prob. 1.50

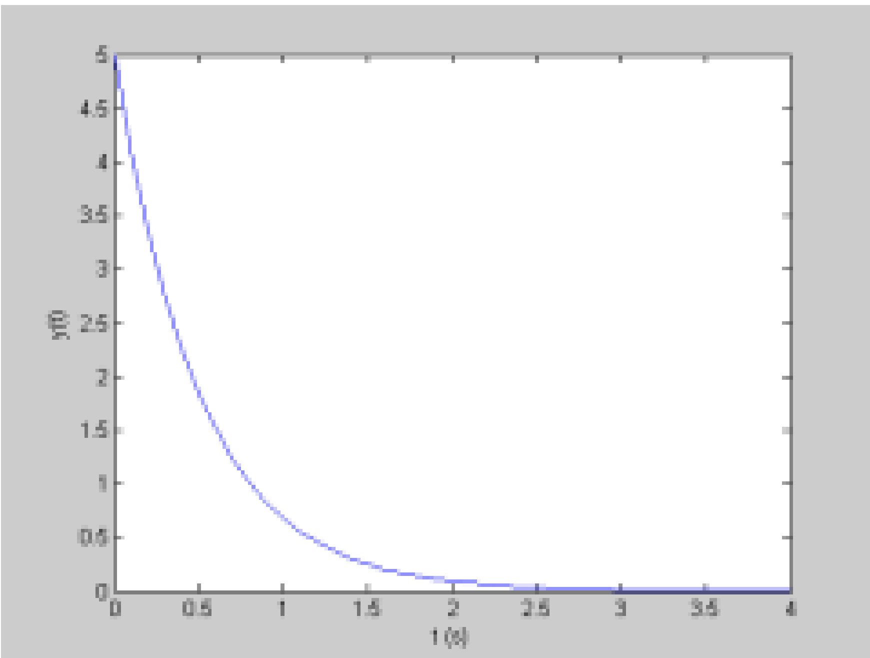
(a) The MATLAB code and the plot are given below.

```
t = [-2 -1 0 1 2 3 4];
x = [ 0  0 0 2 4 6 8];
plot(t,x)
xlabel('t (s)')
ylabel('x(t)')
```



(b) The MATLAB code and the plot are given below.

```
t = 0:0.1:4;
y = 5*exp(-2*t);
plot(t,y)
xlabel('t (s)')
ylabel('y(t)')
```



Prob. 1.50

(c) The MATLAB code and the plot are given below.

```
clear
t = -2:0.1:4;
z1 = 4*cos(4*t);
z2 = 2*sin(2*t - pi/4);
z= z1 + z2;
plot(t,z)
xlabel('t (s)')
ylabel('z(t)')
```