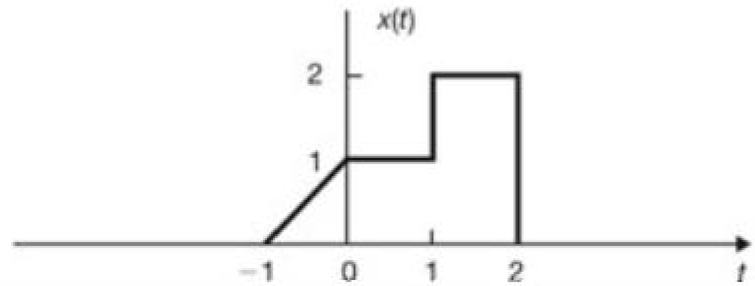
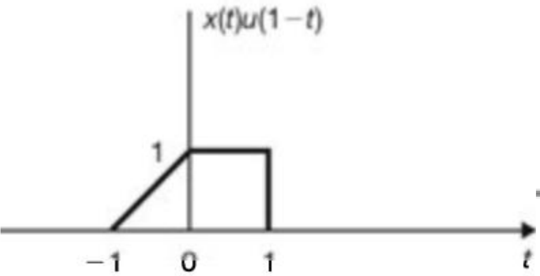
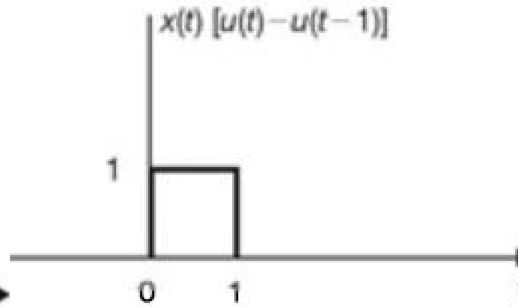
Que 1 (a) $x(t)u(1-t)$; (b) $x(t)[u(t)-u(t-1)]$; (c) $x(t)\delta(t-\frac{3}{2})$



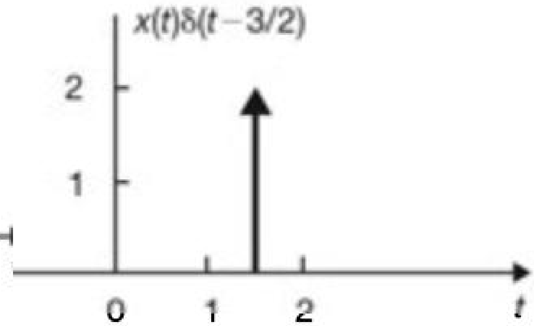
$$u(1-t)=\begin{cases}1 & t<1\\ 0 & t>1\end{cases} \qquad u(t)-u(t-1)=\begin{cases}1 & 0<t\leq 1\\ 0 & \text{otherwise}\end{cases} \qquad x(t)\delta\left(t-\frac{3}{2}\right)=x\left(\frac{3}{2}\right)\delta\left(t-\frac{3}{2}\right)=2\delta\left(t-\frac{3}{2}\right)$$



(a)

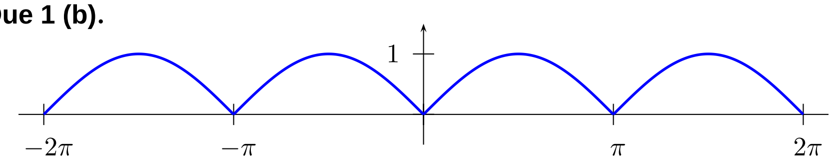


(b)



(c)

Que 1 (b).



Sol 1(b) The period is π so $L=\pi/2$ and $n\pi/L=2n$. The function is even, so the sine terms $b_n=0$. For the cosine terms a_n:

$$a_0=\frac{2}{\pi}\int_0^\pi f(t)\,dt=\frac{2}{\pi}\int_0^\pi \sin t\,dt=-\frac{2}{\pi}\cos t\Big|_0^\pi=\frac{4}{\pi},$$

and for $n\geq 1$,

$$\begin{aligned}
a_n&=\frac{2}{\pi}\int_0^\pi f(t)\cos 2nt\,dt=\frac{2}{\pi}\int_0^\pi \sin t\cos 2nt\,dt\\
&=\frac{2}{\pi}\int_0^\pi \frac{1}{2}(\sin(2n+1)t-\sin(2n-1)t)\,dt\\
&=\frac{1}{\pi}\left[\frac{-1}{2n+1}\cos(2n+1)t+\frac{1}{2n-1}\cos(2n-1)t\right]_0^\pi\\
&=\frac{1}{\pi}\left[\frac{-1}{2n+1}(\cos(2n+1)\pi-1)+\frac{1}{2n-1}(\cos(2n-1)\pi-1)\right]\\
&=\frac{-2}{\pi}\left[\frac{1}{2n-1}-\frac{1}{2n+1}\right]=\frac{-4}{(4n^2-1)\pi}.
\end{aligned}$$

Therefore, the Fourier series is

$$f(t)\sim\frac{2}{\pi}-\frac{4}{\pi}\sum_{n=1}^{\infty}\frac{\cos 2nt}{4n^2-1}.$$