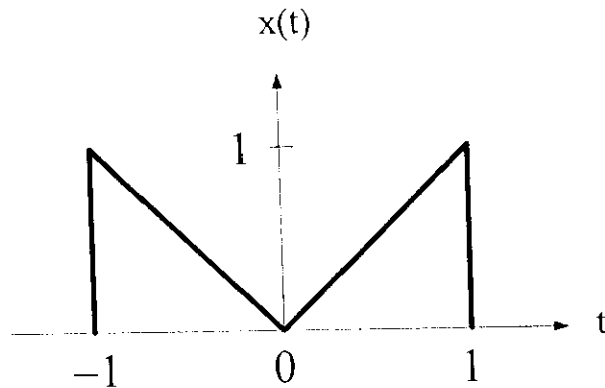
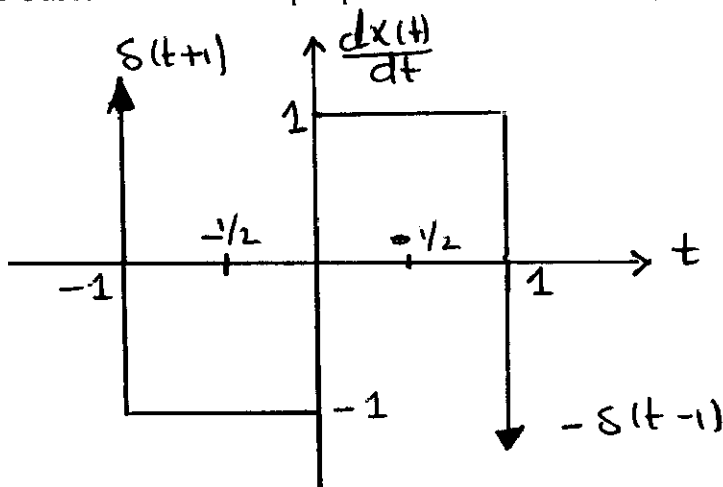


EE 207 - Fall 2009  
Quiz 4

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For the signal  $x(t)$  shown above, find the Fourier Transform  $X(f)$  using the Fourier Transform properties and Table only?



$$\frac{dx}{dt} = \delta(t+1) - \pi(t+\frac{1}{2}) + \pi(t-\frac{1}{2}) - \delta(t-1)$$

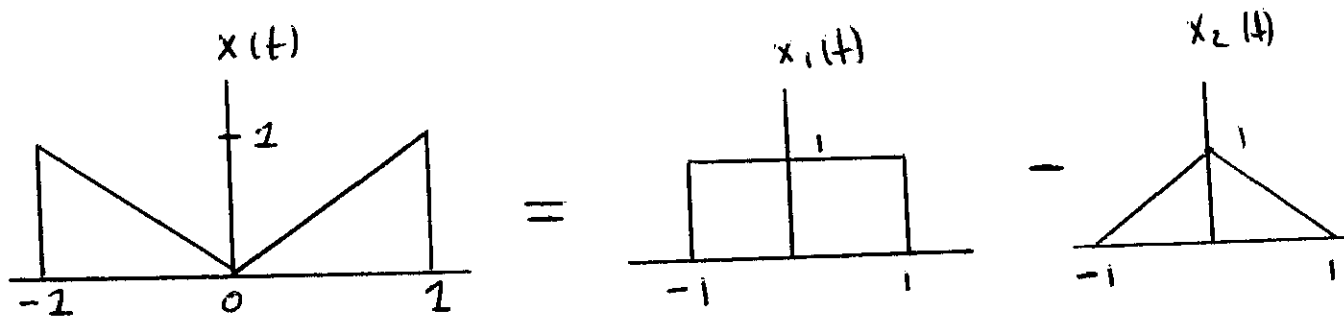
$$F.T \left\{ \frac{dx}{dt} \right\} = (j2\pi f) X(f)$$

$$\begin{aligned} \Rightarrow (j2\pi f) X(f) &= e^{j2\pi f} - \text{sinc}(f) e^{j\pi f} + \text{sinc}(f) e^{-j\pi f} - e^{-j2\pi f} \\ &= e^{j2\pi f} - e^{-j2\pi f} - \text{sinc}(f) [e^{j\pi f} - e^{-j\pi f}] \\ &= 2j \sin(2\pi f) - \text{sinc}(f) (2j \sin(\pi f)) \end{aligned}$$

$$\begin{aligned} \Rightarrow X(f) &= 2 \frac{\sin(2\pi f)}{(2\pi f)} - \text{sinc}(f) \frac{\sin(\pi f)}{\pi f} \\ &= 2 \text{sinc}(2f) - \text{sinc}^2(f) \end{aligned}$$

another solution  $\rightarrow$

Another solution



$$x(t) = x_1(t) - x_2(t)$$

$$= \Pi\left(\frac{t}{2}\right) - \Lambda(t)$$

$$\Rightarrow X(f) = 2 \operatorname{sinc}(2f) - \operatorname{sinc}^2 f$$