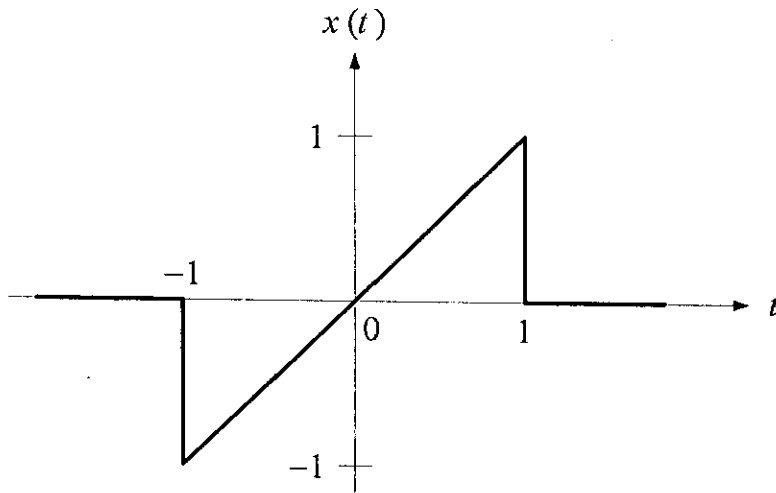


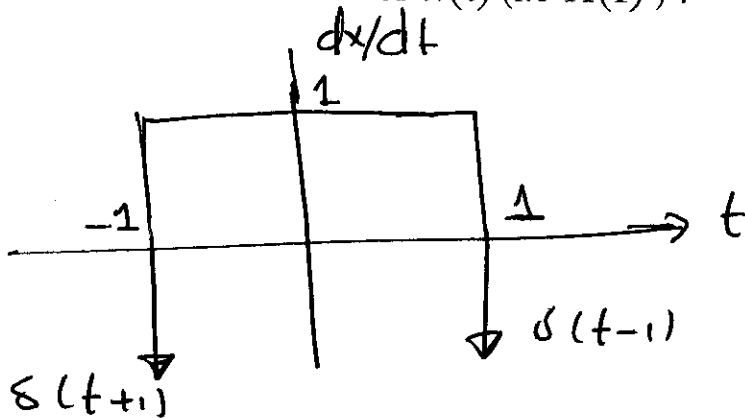
SER	ID	NAME	KEY
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Let  $x(t)$  be a signal as shown below



Using the Properties and Table only

Find the Fourier Transform of  $x(t)$  (i.e.  $X(f)$ )?



$$\frac{dx(t)}{dt} = \text{rect}\left(\frac{t}{2}\right) - [\delta(t+1) + \delta(t-1)]$$

Taking Fourier for both sides

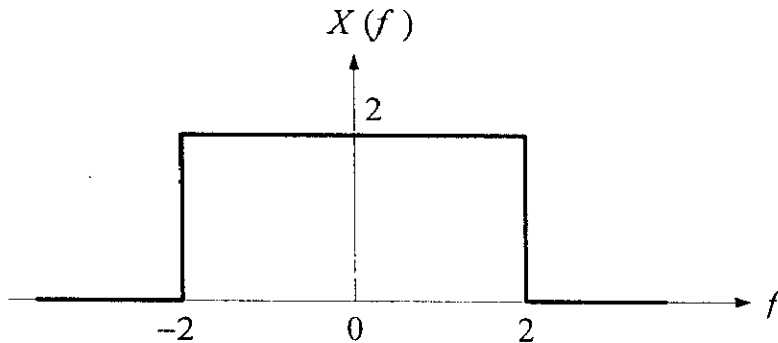
$$(j2\pi f) X(f) = 2 \text{sinc} 2f - [e^{j2\pi f} + e^{-j2\pi f}]$$

$$= 2 \text{sinc} 2f - 2 \cos 2\pi f$$

$$X(f) = \frac{\text{sinc} 2f - \cos 2\pi f}{j\pi f}$$

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If the Fourier Transform of  $x(t)$  is shown below

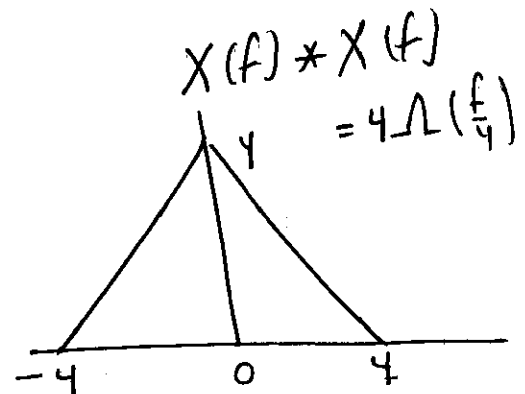
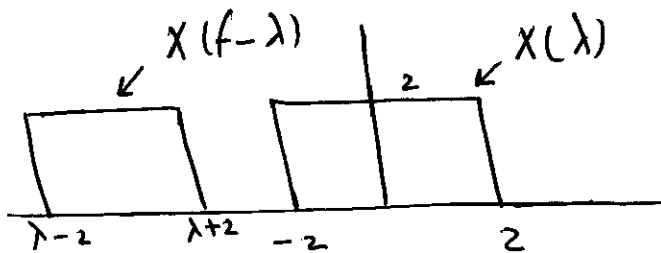


Using the Properties and Table only

Find the Fourier Transform of  $x^2(t)$ ?

$$\text{F.T}[x^2(t)] = \text{F.T}[x(t) \cdot x(t)] = X(f) * X(f) \quad (\text{product property})$$

$$= \int_{-\infty}^{\infty} X(\lambda) X(f - \lambda) d\lambda$$



$$\Rightarrow \text{F.T}[x^2(t)] = 4 \text{triangle}\left(\frac{f}{4}\right)$$

another solution  $\Rightarrow$

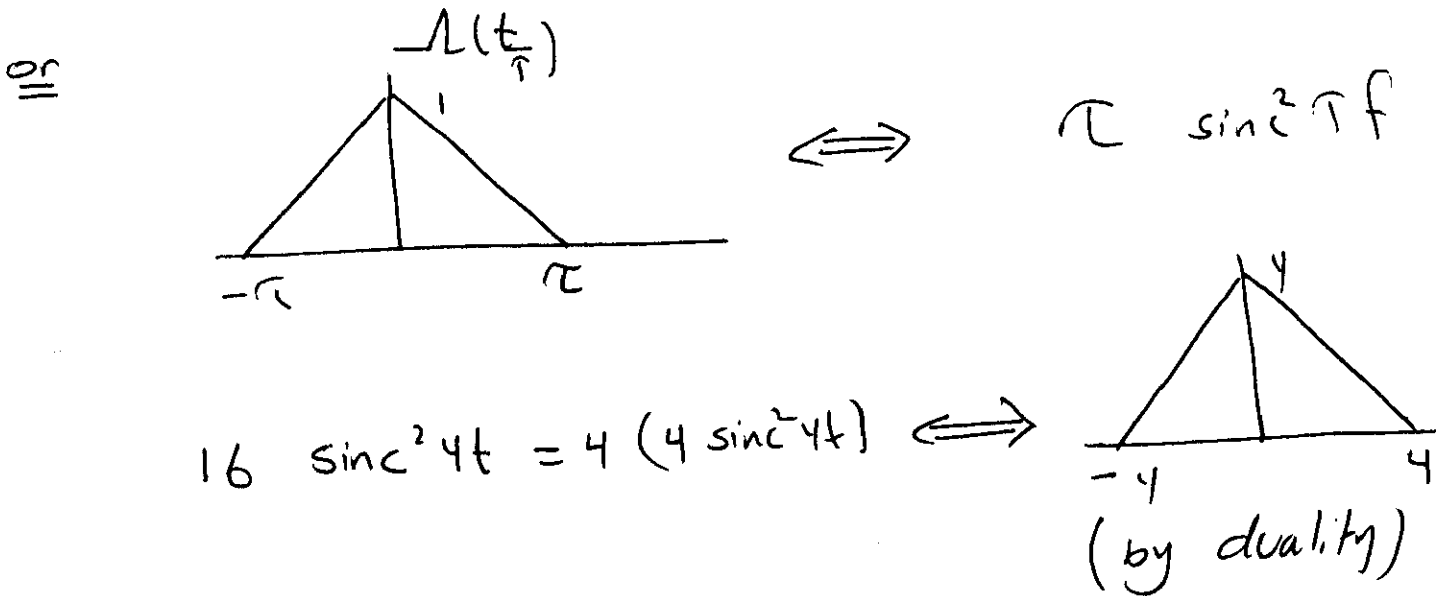
another solution

$$X(f) = \Pi\left(\frac{f}{4}\right) \Rightarrow x(t) = 4 \operatorname{sinc} 4t$$

(from Table).

$$\Rightarrow x^2(t) = 16 \operatorname{sinc}^2 4t$$

From Table  $\Lambda\left(\frac{t}{\tau}\right) \leftrightarrow \tau \operatorname{sinc}^2 \tau f$



$$\Rightarrow \text{F.T}[x^2(t)] = \text{F.T}[16 \operatorname{sinc}^2 4t] = 4 \Lambda\left(\frac{f}{4}\right)$$