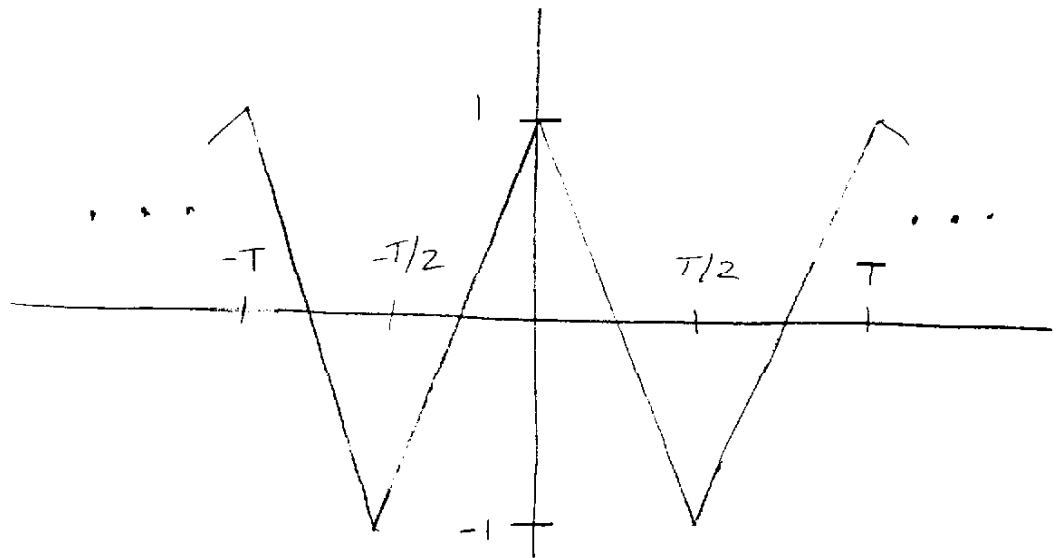1- Show that the trigonometric Fourier Series Representation for $x(t)$ is

$$\frac{3}{\pi^2} \sum_{n=1}^{\infty} \frac{1}{(2n-1)^2} \cos \frac{2\pi(2n-1)}{T} t$$

Hint (1) on the interval $(0, T/2)$ $x(t) = 1 - \frac{4t}{T}$

and on $(T/2, T)$ $x(t) = -3 + \frac{4t}{T}$

2 — Show that

a) $X(\omega) = \dfrac{2\alpha}{\alpha^2 + \omega^2}$

when $x(t) = e^{-\alpha|t|}$

b) $x(t) = \dfrac{\sin \pi t}{\pi t}$

when $X(\omega) = rect\left(\dfrac{\omega}{2\pi}\right)$

Using the definition of the Fourier transform and its inverse.