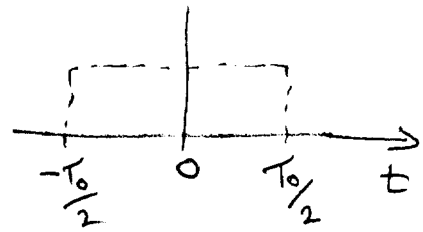
9.1 The Hanning Window is defined as:

$$f(t) = 1 + \cos\left(\frac{2\pi t}{T_0}\right) = \cos^2\left(\frac{\pi t}{T_0}\right) \quad \text{for } |t| \leq T_0$$

$$= 0 \quad , \quad |t| > T_0$$

where T_0 is the window size



(a) Show that the Fourier Transform of the Hanning Window is:

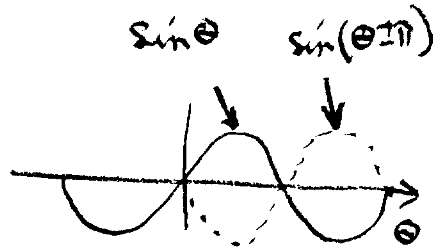
$$F(\nu) = \frac{T_0 \sin(\pi \nu T_0)}{\pi \nu T_0} + \frac{T_0 \sin(\pi(1-\nu T_0))}{2\pi(1-\nu T_0)} + \frac{T_0 \sin(\pi(1+\nu T_0))}{2\pi(1+\nu T_0)}$$

Hint: Recall: $\cos\theta = \frac{e^{i\theta}+e^{i\theta}}{2}$, $\sin\theta = \frac{e^{i\theta}-e^{-i\theta}}{2i}$

(b) Show that $F(\nu)$ above reduces to:

$$F(\nu) = \frac{T_0 \sin \pi \nu T_0}{\pi \nu T_0 (1-(\nu T_0)^2)}$$

Hint: $\sin\theta = -\sin(\theta+\pi)$
$= -\sin(\theta-\pi)$



(c) Sketch $f(t)$ + $F(\nu)$.

9.2 When would you use a Hanning window and when would you use a rectangular window?

9.3 What is the F.T. of: $\Pi_4(t) \cos 2\pi t$
Sketch the signal in both the t & ν domains.

(This is a cosine ~~that~~ has been chopped by a rectangular window)