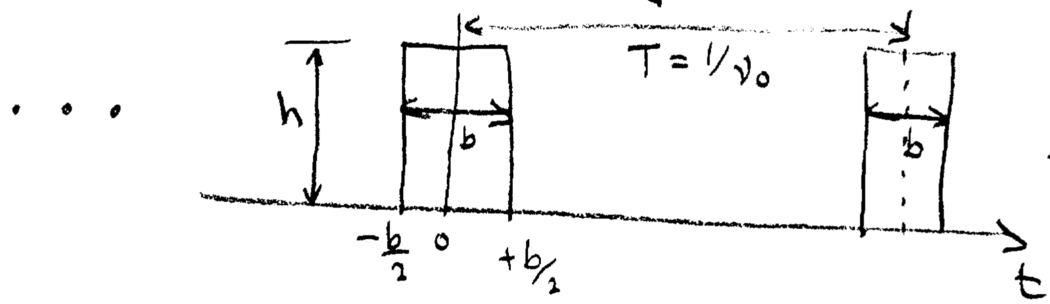
3.1 (a) Use the complex form:

$$f(t) = \sum_{-\infty}^{\infty} D_n e^{2\pi i n \nu_0 t}, \quad \text{where } D_n = \frac{1}{T}\int f(t)\, e^{-2\pi i n t/T}\, dt$$

to calculate D_n for a square wave as shown.



(b) Show that this is the same as that calculated from

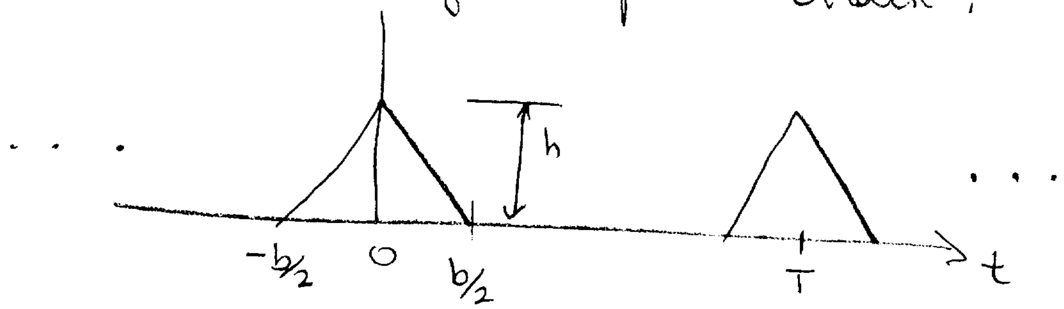
$$f(t) = \frac{A_0}{2} + \sum_{n=1}^{\infty} A_n \cos(2\pi n \nu_0 t) + B_n \sin(2\pi n \nu_0 t)$$

(c) Plot $\frac{D_n}{D_0}$ to show how the amplitudes of the higher order terms diminishes for 2 cases, $b = T/8$ and $b = T/4$.

(d) From (c) you should note that the bulk of the significant terms reside in the main lobe (between $n=0$ + $n = n_0$ where $D_n \to 0$ for the first time). Based on this observation derive an expression for the number of terms (n_0) needed to capture the bulk of the signal.

3.2. (a) Use the complex form to calculate D_n for a triangular pulse train;

$T = 1/\nu_0$



(b) Plot D_n/D_0 for $b = T/8$ + $b = T/4$

(c) Derive an expression for the number of terms (n_0) needed to capture the bulk of the signal. Compare to the square pulse train.