EE354 **Homework #1** **Spring 2009**

1. Given the following signal:

$$s(t)=\begin{cases} 0 & -\frac{T}{2}\le t\le \frac{T}{10} \\ -1 & -\frac{T}{10}\le t\le 0 \\ +1 & 0\le t\le \frac{T}{10} \\ 0 & \frac{T}{10}\le t\le \frac{T}{2} \end{cases}$$

Find:

(a) The exponential and trigonometric Fourier Series formulas for the a_n's, b_n's, and c_n's.
(b) Calculate the a_n, b_n, and c_n values for n = 0, 1, 2, and 3.
(c) Using Matlab, plot the Fourier Series for the first 1, 3, 5, and 11 terms and compare it with the original function.

2. Given the following signal:

$$s(t)=\begin{cases} 3 & -2\le t\le -1 \\ 4 & 1\le t\le 2 \\ 0 & elsewhere \end{cases}$$

(a) Find the Fourier Transform of *s(t)* evaluated at *f = 0*.
(b) Determine the total energy contained in *s(t)*.

3. Given the following three signals:

$$s_1(t)=e^{-at}u(t)$$
$$s_2(t)=\cos(2t)u(t)$$
$$s_3(t)=te^{-at}u(t)$$

Find the Fourier Transform of each signal.

4. Evaluate the following convolution integrals:

(a) $e^{-t^2}*\delta(t-1)$
(b) $u(t)*u(t)$