EECS 360
Lab 8: DFT / FFT

1. Find the formula for a DFT (Discrete Fourier Transform) in your book or on the Internet. Implement this formula for the following sequence

   x = [zeros(1,64), ones(1,128), zeros(1,64)];
   n = [-128:127];

   Use the “stem” and “plot” commands appropriately to display the original sequence, the magnitude spectrum, and the phase spectrum.

2. Answer the following questions

   a) What does FFT stand for?
   b) How does a FFT differ from a DFT?
   c) How does a DFT differ from a DFS? (hint: Look up DFS on the Internet)
   d) If you are given a periodic, discrete time sequence, what transforms can be used to find its frequency spectrum?
   e) If you are given a periodic, continuous time sequence, what transforms can be used to find its frequency spectrum?

3. Use the built-in Matlab “FFT” command on the sequence given in problem 1. Compare your results to your DFT results. (hint: They should be the same)

4. Use the “tic” and “toc” commands in Matlab to time how long it takes for each of the Discrete Fourier Transform techniques (DFT/FFT) to calculate the frequency response. Be sure to time only the calculating functions, not plots or other unrelated events. Which technique is the fastest?

5. Repeat step 4 for different sequence lengths (very short ~ 10, short ~ 50, medium ~ 200, long ~ 500, very long ~ 1000). Is one technique always faster or slower than the other?