# Math 478/578: Computer Assignment 5 — due Thursday, April 19, 2007

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1. Execute the command `plot(sin(1:3000),'.')` in Matlab. What do you see? What does this have to do with aliasing? Give a quantitative answer, explaining exactly what frequency is being aliased by your eyes and brain to what other frequency.

2. Modify the Matlab script `BandLimitedDemo.m` to determine the maximum error over $\mathbb{R}$ of the sinc function interpolants of the square wave and the hat function, and to produce a log-log plot of these two error maxima as functions of $h$ where $h = 2^{-k}$ for $k = 3, 4, 5, 6$. What convergence rates do you observe as $h \to 0$?

3. Use Matlab's `tic` and `toc` commands to compare the computational time for spectral differentiation via differentiation matrices and via FFTs. Do this by modifying the scripts `SpectralDiffDemo.m` and `SpectralDiffFFTDemo.m` and calling them from a driver program for a sequence of $N$-values such as $N = 2^k$ for $k = 0, 1, \ldots, 15$. Produce log-log plots of time vs. $N$. What is the apparent order of the computational effort?