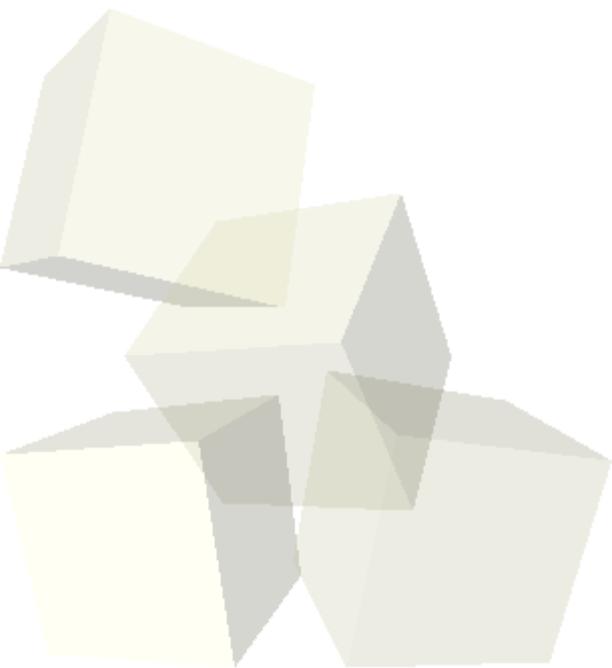
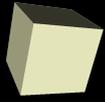




# Integration and Differentiation

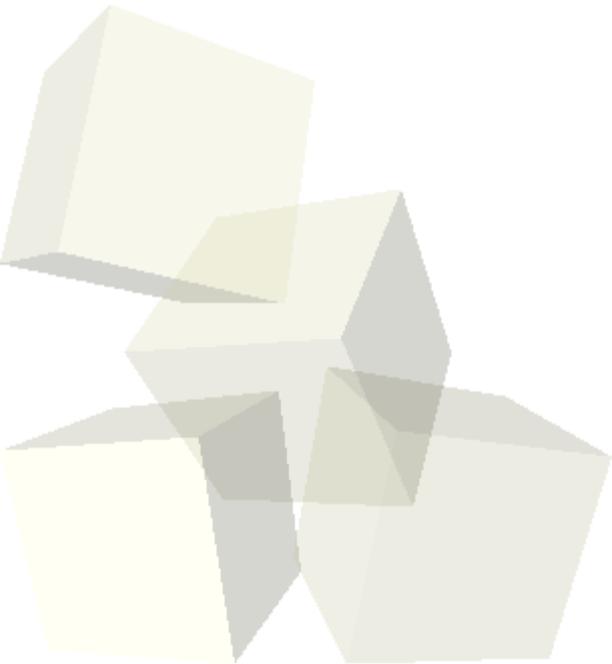
2/22/2008

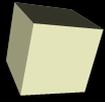




# Opening Discussion

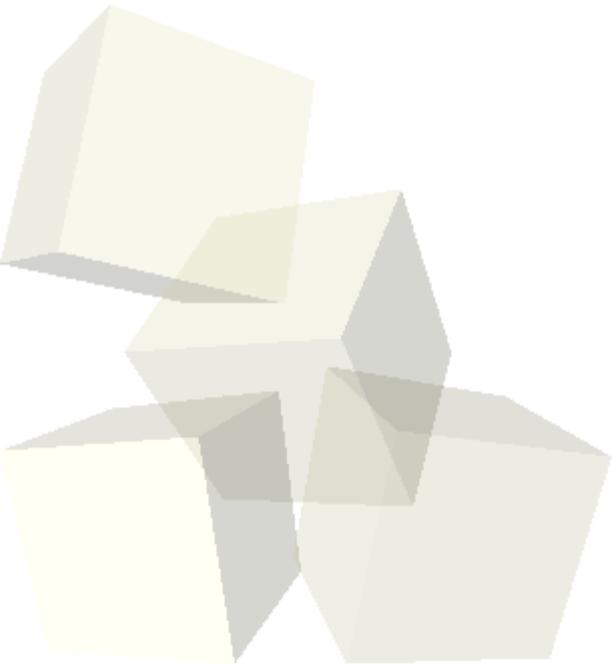
- What did we talk about last class?
- Let's talk about the project for this class. What do you want to do?

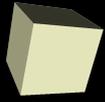




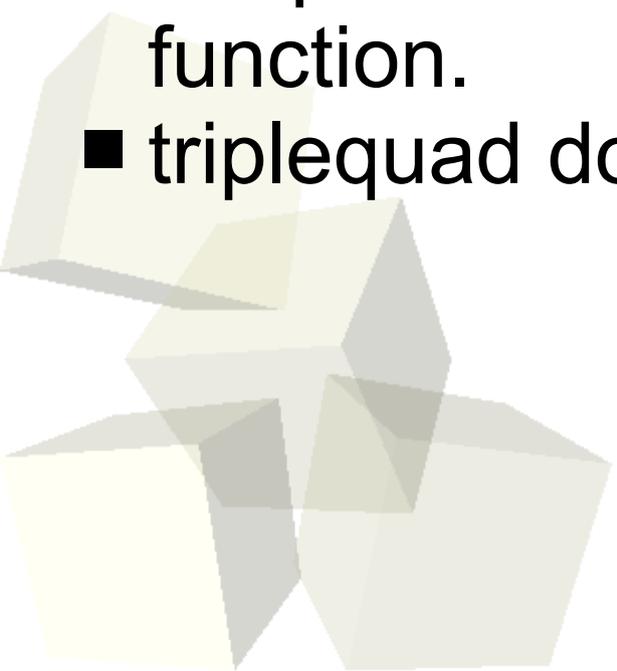
# Fourier Analysis

- Let's try to do a fft of some real data and see if we can actually pick out the frequencies that are supposed to be there.



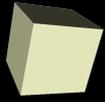


- Matlab has several functions for doing numerical integration.
  - ◆ trapz uses the trapazoid rule on data
  - ◆ cumtrapz also uses the trapazoid rule, but as a cumulative integral on data
  - ◆ quad and quadl do quadrature on a function (Simpson's rule with variable interval sizes.)
- dblquad can be used to do 2-D integration on a function.
- triplequad does 3-D integration of functions.

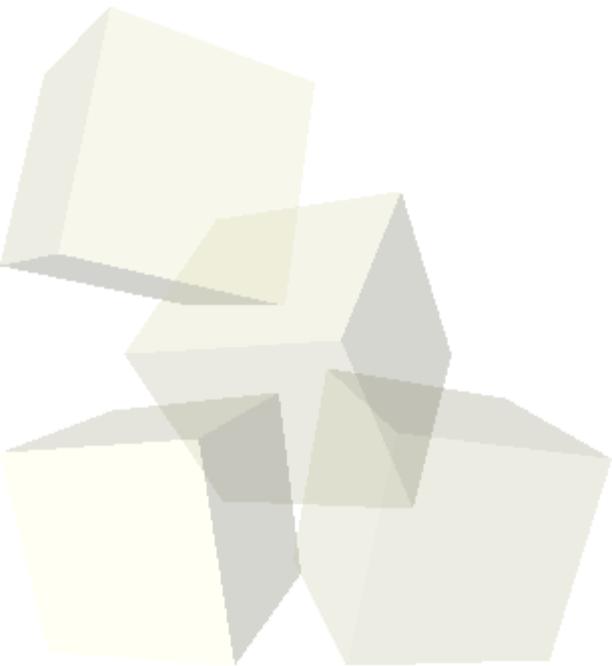


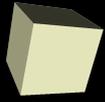


- Numeric differentiation is something that is generally frowned upon. The reason is simply that difference methods are not well behaved, especially when dealing with noisy data from an experiment. If you have that type of data you should do some type of fitting and take a derivative of the fit.
- Using polyfit and polyder is a good way of dealing with this type of data.
- The diff function can be used for numerical derivatives. Manually doing a central difference is more accurate.



- Do you know what the meaning of a gradient is? Matlab has a built in function that will calculate a gradient for grid data.
- The `del2` function takes a numerical Laplacian. This measures the curvature and is basically a second order gradient.





# Closing Comments

- Quiz #3 is next class.
- You have a week for assignment #5.

