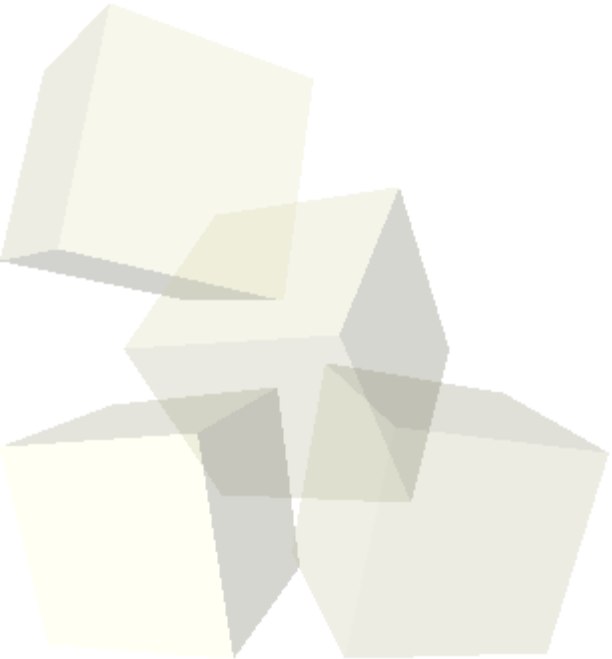
More Differential Equations

10-2-2006

Opening Discussion

- What did we talk about last class?
- Do you have any questions about the assignment?



Finishing Off Euler's Method

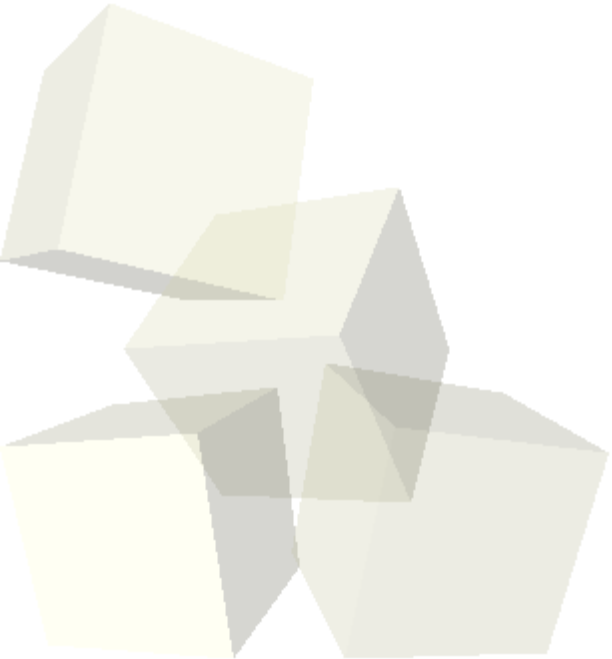
- Last time we started writing an Euler's method to demonstrate to you the making of a simple integrator. We need to finish that and use it to integrate a problem.
- The simplest problem to solve is the mass on a spring with Hook's Law. We'll do that first.

Using the ode Functions

- In order to use ode45 of other ODE solving functions, we must define our function in an m-file because we want to pass a handle to it into the ode function. This function should return the derivatives as a column vector.
- If we don't use any return values the function will simply show a plot. A single return value returns a structure. Having two return values gives us the times as well as the arrays of values at each time. That can then be plotted as we see fit.

Multibody Systems as ODEs

- So how do we represent a multibody system as an ODE? What are the variables that we need? What does the system of equations look like?
- The simplest system is probably gravity. Let's set up an N-body gravitational system and solve it with ode45.



Examples

- ODEs abound in physics. The simplest ones involve solving the paths of particles interacting through a force like gravity or having masses on springs.
- Population biology can also be expressed as differential equations. Consider things like predator-prey models where how quickly a population changes depends on how much food it has, how many there are now, and how many predators there are.

Reminders

- Assignment #5 is due on Wednesday and Quiz #3 will be on Friday.
- Next week there won't be any class, but you should be working on the project.
- We will talk about the project in more detail on Wednesday.