Chaotic Dynamical Systems: Projects

One major goal of this course was to provide you with the background vocabulary and tools to investigate chaotic behavior. A major portion of the course will be to examine some phenomenon in depth, and provide a written report of your findings. To assist you, here is a list of possible projects that you can work on. If you have something else in mind, please let me know that as well. Every project should include some computational aspects using Matlab. You'll be presenting your results to the class (we'll decide on the particular times later).

First Deadline: Tuesday, October 16th Decide on a project and if you'll be working in a group. Start collecting literature. The next deadline is in about two weeks...

Second Deadline: Thursday, November 1st Have a rough draft ready, and have the literature available. If you're collecting data, then you should have the data at this point...

Third Deadline: Thursday, November 15th Show me a progress report: What do you have finished, and what do you plan to finish (there's two weeks left after Thanksgiving Break).

Possible Projects:

(1) Fractal Geometry (reading, some modeling, lin alg)
(2) The Forced Pendulum (modeling, diff eqns)
(3) The Flocking Behavior of Birds (library research, some modeling)
(4) The Pendulum over Three Magnets (modeling, diff eqns)
(5) Is the Heart Chaotic? (library research, some modeling, possibly gathering some data)
(6) Newton's Method in the Complex Plane (Some reading, modeling)
(7) Fractal Dimension (What is dimension? How to compute it?)
(8) A Closer Look at the Mondelbrot Set (Some reading, modeling)
(9) Is the Stock Market Chaotic or Random? (library research, some modeling/data gathering)
(10) Embedology: Extracting Dynamics from a Time Series (reading, modeling, diff eqns).
(11) Choose something from Chapter 18, Further Projects.
(12) Research a particular mathematician's work (Smale, Lorenz, Yorke, etc.)

Basically, I'm looking for you to get a paper (or papers) to read and understand (depending on the topic, I've got some papers). This will include verifying numerical results, where possible. I'll be looking specifically for your use of the vocabulary, theorems and ideas from the class.

A final note: A well written research paper can be very helpful outside the classroom! For example, you can use it as a starting position for future research and talks, it's always helpful to be able to give references copies of such papers, as well as to prospective employers...