HW 0, MA563 Applied Dynamical Systems, Erik Bollt, Spring 2008,
Due Mon Jan 21

This homework consists of running some preset codes in Maple, and Working through a Matlab Worksheet. Computers serve a central role in applied dynamical systems. We will therefore use computers extensively in this class, but only a small amount of computer skills are necessary. So the following are setup to be a do-it-yourself quick start. I have worked this exact approach many times, and I have found it to work quite well with students. Please see me if you are having problems!

The computer software is available in Clarkson Computer labs, if you do not already own copies.

1. Run the Maple Commands in the download. You may cut and past the red code into a maple work sheet. Run each command one-by-one, and observe the outcome. It is carefully designed to help you observe all of the common inputs and outputs, so please do pay attention! Then printout the result as evidence.
2. Run both of the ODE and Rossler (ODE) examples.
3. Read carefully the Gilliam Matlab notes, and answer the following questions:
4. G#1p6, 1-3, 6-8, G#2p11, 1-8, 10, 11 G#3p8, 1, 2 (make sure you DO it with loops and then also with array arithmetic without loops as asked!), 3, 4a (again with and without loops), 5, 11G#4p6, 1,2, 4.
5. Using the Example Eq (1.5), page 3, (JDM), modify the Maple scripts supplied to recreate the picture in Fig. 1.1. THEN, using each of the following initial conditions, (x(0),y(0))=(1,2), (x(0),y(0))=(0,0), and, (x(0),y(0))=(0,-2), draw in (by pencil by hand) on a printout of that vector field, the resulting solution. Describe in words how solutions of this system behave.
6. Consider the one-dimensional ODE, $x' = x^3 \quad x$. a-c give graphical ways to visualize solutions, whereas d discusses the analytic symbolic approach. We will discuss numerical later. (graphical/symbolic/numerical).
    a. Draw a "phase-line" representation (like JDMp7, Fig 1.3), indicating equilibrium, and labeling their stability type.
    b. Use Maple to draw the vector field, (adapting the linked Maple worksheet).
    c. Draw into the figure in b) several typical solutions, similarly to those shown in Fig. 1.2.
    d. Proceeding as in page 7, example leading to (1.9), solve for the general solution of this initial value problem, $x' = x^3 \quad x, x(0) = x_0$.
7. p23, 1.8, #1 (Here "analyze" means proceed as you did above in #6.), and #7.

8. Spend special attention to read carefully (just because they are cool applications in important fields of science, but I am not expecting you to hand in anything), 1.8, #2, #3, and #4