Math 4452: Math Modeling Assignment 4 Due: Mar 19 2002

The due date is flexible, since I know many of you are going away for spring break and will not be able to work on this assignment over that week. You will still be getting Assignment 5 on March 19, so it would be best if you worked ahead rather than leaving this assignment until after spring break.

For this assignment, I am giving you some suggested problems below. However, if there are other problems which interest you more, feel free to tackle them instead of the ones I suggest.

The problems you do hand in should involve dynamical systems, so the solution should either use differential or difference equations, with eigenvalue stability analysis.

If you do choose your own problems, I would like you to do at least two different problems, and for each give a <u>short</u> discussion as to why you choose that particular problem (I am just interested, you won't be graded on this part).

Feel free to talk to me about the problems you would like to do if you have any questions.

(50) 1. **Comparison of Discrete and Dynamical Models** Problem 6.5.20 from the text.

(50) 2. **Runge Kutta Order 4** Problem 6.5.21 from the text. Runge Kutta (RK) methods are probably the most commonly used numerical method to solve systems of differential equations. I think that any of you who are going on to graduate study in physics would benefit from taking a closer look at RK. The book asks some questions, but you should also play around with the step size and see how that affects your answer (verify numerically the halving h produces a result 16 times more accurate (what does that mean anyway?)), and compare RK4 to Euler's method for the same step size, and anything else you think is fun.