Math 2030
Spring, 2007
Study Sheet, Test 1

The first test on Wednesday, February 28, will cover Chapters 1 through 8.

Definitions. You should know basic definitions: Manderbrot set, Julia set, (eventual) fixed point, (eventual) periodic point, prime period, (weakly) attracting (repelling, neutral) fixed point, (weakly) attracting (repelling, neutral) periodic point, saddle-node (or tangent) bifucation, period doubling bifurcation, open interval, the Cantor set, countable set.

Basic Concepts and Theory. You should know how to define and graph basic functions we have studied: the logistic function, the doubling function, the tent function, the quadratic family of functions. You should be able to discuss the two bifurcations we have studied that take place for the quadratic family. You should understand the basic construction of the Cantor set and have some understanding of its basic properties: self-similar, closed, totally disconnected, uncountable. You should understand how to represent real numbers between 0 and 1 as (infinite) ternary decimals and the ternary characterization of points in the Cantor set. Know how the orbit diagram is defined, how its graph is computationally generated and basic elementary features (moving right to left it begins with a sequence of period doubling bifurcations, the diagram is visible between -2 and 0.25, there is a larger periodic window of period 3 toward the left side of the orbit diagram, there are solid or almost solid vertical lines that represent chaotic parameters, the diagram is self-similar, etc.).

Techniques. You should be able to form iterates of a function. You should be able to find fixed points, periodic points of period 2, and orbits of points for elementary systems. You should be able to carry out and illustrate simple examples of graphical analysis (linear and quadratic graphs) and the phase portrait for simple dynamical systems. You should be able to test whether a fixed point is attracting, repelling, or neutral using the deriviative and whether or not it is weakly attracting or repelling with graphical analysis. You should be able to do the same for periodic points by taking the derivative along a cycle. You should be able to change simple ternary decimals to rational numbers (fractions).

Homework Problems. You should be able to work problems that are similar to assigned homework problems.