

Math 2030
Spring, 2007**Study Sheet, Chapters 14-17**

The final will be in the usual classroom, 7:30-9:30 Tuesday.

Definitions. You should know basic definitions: fractal, iterated function system, filled Julia set, Julia set, bounded set, Mandelbrot set

Theory. You should know the tests in complex dynamics to determine whether a fixed point (periodic orbit) is attracting, repelling, or neutral. You should be able to explain the construction for the Sierpinski triangle and the Sierpinski carpet. You should have a working understanding of fractal dimension and be able to find it for specific examples. You should understand how to generate fractals by random generation and by intersection of smaller and smaller images. You should have a basic understanding of complex numbers (their arithmetic, graphing, absolute value, polar representation, and elementary calculus). You should know the algorithm for computer generating a filled Julia set, the backward iteration algorithm for generating the Julia set, and the algorithm for computer generating the Mandelbrot set. You should know the Escape Criterion for $Q_c(z) = z^2 + c$ whenever $|c| \leq 2$. You should understand the complex dynamics of the squaring map $Q_0(z) = z^2$, $Q_{-2}(z) = z^2 - 2$, and of $Q_c(z) = z^2 + c$ for $|c| > 2$. You should know the Fundamental Dichotomy and the two types of Julia sets that arise in it.

Problem Solving Techniques. You should be able to compute fractal dimension. You should be able to compute images under affine mappings and find their (attracting) fixed points. You should be able to convert between the usual and polar representations of complex numbers and be able to find the two square roots of a complex number. You should be able to find fixed points of elementary complex dynamical systems (by solving the appropriate complex equations) and determine whether they are attracting, neutral, or repelling. You should be able to compute the first few points in the orbit of 0 for a specific $Q_c(z) = z^2 + c$ and determine whether the point is in the Mandelbrot set.

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