Dror Bar-Natan: Classes: 2003-04: Math 157 - Analysis I:

Homework Assignment 22

Assigned Tuesday March 9; due Friday March 19, 2PM, at SS 1071

Required reading. All of Spivak's Chapter 22.

To be handed in. From Spivak Chapter 22: 1 (odd parts), 2 (odd parts), 5, 13.

Recommended for extra practice. From Spivak Chapter 22: 1 (even parts), 2 (even parts), 9, 27, 28, 29.

Just for fun. For some constant number c, consider the function $f_c(x) = 4cx(1-x)$. Let A be the set of all pairs (c, y) so that $0 \leq c \leq 1$ and y is a limit of a subsequence of the sequence $f_c(\frac{1}{2})$, $f_c(f_c(\frac{1}{2}))$, $f_c(f_c(f_c(\frac{1}{2})))$, ... Write a computer program to draw the set A in the plane whose axes are c and y, and if your program and picture are nice, they'll find their place on this class' web site.

It's a hard one, but it's well worth it. The set A is way more complex than you would expect, with parts that scream "structure" and parts that scream "mess". If you've ever heard the word "chaos" in a mathematical context before, this is it. And if you've ever seen pictures of the beautiful "Mandelbrot Set", our A is a close relation.