Math 388 Exercises

Instructions: due Tuesday.

1. Modify the Mathematica program to draw a right Sierpinski triangle with vertices (0,0), (1,0) and (0,1).
2. For the right Sierpinski triangle in #1, start with the square [0,1]x[0,1] and apply the three rules to it for three iterations. Will it converge to the right Sierpinski triangle?
3. Run the Koch snowflake program with the starting vertices $v = \{\{0,0\}, \{\frac{1}{2}, \frac{\sqrt{3}}{2}\}, \{1,0\}, \{0,0\}\}$. What change does this make?
4. Modify the program in #3 in multiple ways to produce your own fractal. Be creative! Explain as fully as possible how to create your fractal by hand. I will give bonus points to the "best" fractal as judged by the faculty.
5. Show the basin of attraction for 0 using Newton's method on $x^3 - 3x^2 + 2x$. First, show the basin for $-2 \leq x \leq 2$ and then zoom in to show self-similarity.

Read the chapter "Images of Chaos" and answer the following questions.

6. If the Mandelbrot set is the most complex object in mathematics, how can it be generated by just a few lines of code? Describe one way in which the Mandelbrot set is complicated.
7. What is the lesson/warning for engineers in Yorke's fractal basin boundaries?
8. How important is randomness in the chaos game?