MA 471-671
R. L. Devaney
Final Exam — 2006

Name: _____

Do EACH of the following problems. In each case, show all work, and make sure your essays are written in proper English with correct spelling and grammar. Please include relevant graphs or pictures.

Do EACH of the following problems. Each essay should be approximately 2-3 pages in length. It should be written in proper English and accompanied by relevant graphs or pictures. You should discuss all relevant aspects of the topic, and your essay should be presented in coherent fashion.

1. The sequence space and shift map. In an essay, discuss the definition and structure of both the sequence space and the shift map. Prove that the shift map is chaotic.

Continue your essay here

Continue your essay here

2. Define dense subset. Give several examples of dense and non-dense subsets. Then prove or disprove: The set of all sequences in the sequence space that end in the repeating sequence $(\ldots 01010101\ldots)$ is dense in the sequence space.

Continue your essay here

Continue your essay here

3. The Mandelbrot Set. In an essay, discuss the structure and meaning of the Mandelbrot set. Be sure to include a discussion of how you can "read off" the periods of the primary bulbs from these bulbs' geometry. Finally, find a formula for the boundary of the main cardioid.

Continue your essay here

Continue your essay here

4. Cantor set. In an essay discuss the Cantor Middle Thirds set. Describe its construction and other features of this set. Prove that this set is uncountable. Discuss the fractal dimension of the set.

Continue your essay here

Continue your essay here

5. Bifurcations. In an essay, discuss the saddle node bifurcation on both the real line and complex plane. Be sure to draw graphs and give examples. Also discuss the global ramifications of this bifurcation in the plane.

Continue your essay here

Continue your essay here