Honors 225 – Homework 5 – due Monday, April 12

1. When talking about orbits, we can them to itineraries. What can you say about itineraries of periodic orbits? Show that the set of all itineraries is uncountably infinite and the set of all periodic orbits is countably infinite. What does this say about the likelihood that a “randomly chosen” orbit will be periodic? Answer these in a well-written paragraph or two.

2. For the tent map, calculate the number of distinct orbits of periods 8, 9, and 10 which are not periodic with any smaller period. This continues the discussion from class last Wednesday. You need to count the fixed points of the appropriate iterate of $T$, and then subtract those points from smaller periods.

3. For the system with parameter $a$ given by

$$x_{n+1} = a - x_n^2$$

find the two values of $a$ where the fixed points change in stability.

4. The picture on the handout shows both the “bifurcation diagram” and the Lyapunov exponents for the family

$$x_{n+1} = a - x_n^2.$$

Describe what is happening when the Lyapunov exponent first climbs to 0 and then also what is happening when the wider white strip appears in the bifurcation diagram when $a$ is roughly 3/4 of the way across the horizontal axis.