

Math 53 Chaos!: Homework 4

due Fri Oct 26 ... but best if do relevant questions after each lecture

The first part (Friday's material) is relevant to Midterm 1.

Other than that for exam practice I suggest you write out definitions and the key theorems from Ch. 1–2 from memory, so you can reliably recall and use them.

T3.2 (easy and has some review of Ch. 1. Be sure to find Lyapunov *exponent* not *number*)

T3.3 (easy but good recap of a proof technique from before)

3.1 great review. [Hint: part d the key word is attracting. Factor out the roots as one, not separately, and later look for product of roots. Part e sketch graph and $y = x$ and think about conjugacy].

T3.8 (please show why the string of C' evaluations cancels out)

T3.10 A lovely result with very little effort, now you have the machinery.

3.4

3.5

3.7 (use your well-oiled machinery)

3.10 (satisfying warm-up for Sharkovskii proof)

Challenge 3 : Work through Step 2 (it is easy, and we'll have done at least Step 1 in class), and Step 3 (basically the book explains it). Please write up:

Step 4. (tricky) I was confused for a while about the difference between an orbit of period $p - 2$, and having $k = p - 2$. They are not the same thing. It helps to draw some rows of dots, add arrow patterns, get the transition graph, to decide what period orbits exist.

Step 5. Draw many rows of 9 dots and try various arrow patterns. I'm content for you to show me examples of how p3, p5, or p7 arise if you break the pattern shown (either choose the wrong location for A_1 , or wrong spiral pattern). If you can rigorously prove no other pattern occurs, you deserve a BONUS.

Step 6. (beautifully quick: the reward for your efforts!)

That's enough for now. The rest of the proof I leave for a rainy day.