

Math 388 Exercises

Instructions: due Tuesday after break.

1. Partition the interval $[0, 1]$ into $A = LL$, $B = LR$, $C = RR$ and $D = RL$ for the tent map. Draw the transition graph for the tent map. Use the transition graph to show that the tent map has a period-6 cycle.
2. A reasonable question is what is so special about the transition graph of a map with a period-3 cycle compared to the transition graph of a map with a period-4 cycle. You will explore that in this problem. First, assume that $a < b < c < d$ and f is a map with a period-4 cycle $\{a, b, c, d\}$ with $f(a) = b$, $f(b) = c$, $f(c) = d$ and $f(d) = a$. Draw the transition graph and draw conclusions about the existence of period- k cycles.
3. Repeat #2 with $f(a) = d$, $f(d) = b$, $f(b) = c$ and $f(c) = a$.

Read chapters "The Butterfly Effect" and "A Geometry of Nature" in Gleick's *Chaos* and answer the following questions.

4. What was unusual about Lorenz studying weather prediction on computers?
5. What was Laplace's view of prediction?
6. How did Lorenz discover sensitive dependence in the weather?
7. In what way did White and Lorenz disagree about the significance of the butterfly effect?
8. Give an example of the butterfly effect from your everyday life.
9. In what way(s) is Mandelbrot an outsider?
10. Who is Bourbaki?
11. What does transmission noise have to do with the Cantor set?
12. What does a non-integer dimension mean?
13. What are some examples of fractals?