

Math 4, Introduction to Mathematical Chaos

Spring 2006

HOMEWORK #4

Due Tuesday May 2, 2:30pm, 2006

- (1) Show that the topological Markov chains determined by matrices

$$\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix} \quad \text{and} \quad \begin{pmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$$

are topologically conjugate.

- (2) Show that the linear map given by the matrix

$$\begin{pmatrix} 1 & -1 \\ 1 & 0 \end{pmatrix}$$

defines the map on the two dimensional torus. What are the dynamical properties of this map (transitivity, periodic points)?

- (3) What is the number of periodic points of (not necessarily prime) period n for the solenoid map?
- (4) What is the topological dimension of the Serpinski carpet?
- (5) Find the box counting dimension of the set $E = \{0, \frac{1}{2}, \frac{1}{3}, \dots, \frac{1}{n}, \dots\} \in \mathbb{R}$.