## DYnamical Systems

## Homework \#2

## Problem 1.

What is the number of periodic points of (not necessarily minimal) period 8 of the topological Markov chain $\sigma_{A}$ given by the matrix

$$
A=\left(\begin{array}{llll}
1 & 0 & 0 & 1 \\
1 & 1 & 0 & 0 \\
0 & 1 & 1 & 0 \\
0 & 0 & 1 & 1
\end{array}\right) ?
$$

## Problem 2.

Is it possible to find a topological conjugacy between $\sigma_{3}: \Sigma_{3} \rightarrow \Sigma_{3}$ and $\sigma_{2}: \Sigma_{2} \rightarrow \Sigma_{2}$ ? Semiconjugacy?

## Problem 3.

Consider the following map of a torus $f: \mathbb{T}^{2} \rightarrow \mathbb{T}^{2}, f(x, y)=(2 x, 3 y)(\bmod 1)$. Prove that $f$ is topologically mixing, periodic points of $f$ are dense in $\mathbb{T}^{2}$, and find the number of periodic points of (not necessarily minimal) period $n$ for each $n \in \mathbb{N}$.

## Problem 4.

This problem will not be graded. Suggest (as many as you can, better at least three) problems on the topics covered (expanding maps of a circle, topological Markov chains, hyperbolic automorphism of a torus) that you would suggest for this homework. You do not need to provide solutions.

