1. Let $A$ be a matrix of zeros and ones. A vertex $v_i$ can be reached (in $n$ steps) from a vertex $v_j$ if there is a path (consisting of $n$ edges) from $v_i$ to $v_j$ along directed edges of $\Gamma_A$. What properties of $A$ correspond to the following properties of $\Gamma_A$.

   (a) Any vertex can be reached from some other vertex.
   (b) There are no terminal vertices, i.e., there is at least one directed edge starting at each vertex.
   (c) Any vertex can be reached in one step from any other vertex.
   (d) Any vertex can be reached from any other vertex in exactly $n$ steps.

2. Let $A$ be an $m \times m$ matrix of zeros and ones. Prove that:

   (a) the number of fixed points in $\Sigma_A$ is the trace of $A$;
   (b) the number of allowed words of length $n + 1$ beginning with the symbol $i$ and ending with $jh$ is the $i,j$th entry of $A^n$; and
   (c) the number of periodic points of period $n$ in $\Sigma_A$ is the trace of $A^n$.

3. Show the existence of a non-fixed periodic point of $f_\mu$ (the quadratic map) of period 3 for $\mu > 4$.

4. Is the period-2 orbit attracting or repelling for $\mu > 4$?

5. Show that the periodic points of a hyperbolic toral automorphism are dense.

6. Show that the eigenvalues of a two-dimensional hyperbolic toral automorphism are irrational.