

## Exercise Sheet 8 — Chaos and Fractals (MTH6107)

due: Thursday, 27 November 2008, 5pm

1. Prove that the map  $f(x) = x^2 + c$  is topologically conjugated to the logistic map  $g(y) = 1 - \mu y^2$ . Determine the conjugacy  $h$  and the relation between the parameters  $c$  and  $\mu$ .
2. The Henon map is the following 2-dimensional mapping  $\vec{f}: \mathbf{R}^2 \rightarrow \mathbf{R}^2$ .

$$\begin{aligned}x_{n+1} &= 1 - ax_n^2 + y_n \\ y_{n+1} &= bx_n\end{aligned}$$

$a \in [0, 2]$  and  $b \in [-1, 1]$  are parameters.

- a) Determine all fixed points of the Henon map.
  - b) Write down the Jacobi matrix of the Henon map.
  - c) Determine the eigenvalues of the Jacobi matrix.
  - d) Discuss the stability of the fixed points for the special choice  $a = \frac{35}{16}$ ,  $b = \frac{1}{2}$ .
3. Suppose you were the lecturer of a course on chaos and fractals. Invent a question for an exercise sheet and provide a proper solution.