

ASSIGNMENT 2

Tutorial session August 8th — not for assessment

1. Consider the “Sine map” $f(x) = q \sin(\pi x)$ of *Chaos for Java*. Choose $q = 0.94$.
 - (i) Using the “Graphical analysis” option, find all fixed points of f , $f_2 \cdots f_5$, and the derivative value for each. Tabulate your data.
 - (ii) Construct a table showing the *number* of periodic orbits of each period from 1 to 5, as on page 35 of the text, or lecture notes page 21.
 - (iii) Returning to the data of part (i), group the fixed points found there into orbits (a pair of points for a period 2 orbit, etc.), and classify the stability of each using the derivative data.

 2. Iterations of the tent map may be classified by sequences $LRRRLR \dots$ according as the x values fall to the left (L) or right (R) of the maximum of $f(x)$ at $x = 1/2$. Thus, for $t = 1$, there is one 2-cycle LR , and two 3-cycles $(\frac{2}{9}, \frac{4}{9}, \frac{8}{9})$ (LLR) and $(\frac{2}{7}, \frac{4}{7}, \frac{6}{7})$ (LRR).
 - (i) Find and classify all of the 4 cycles when $t = 1$ (that is, derive formulae for the points on the orbit).
 - (ii) Use the “Graphical Analysis” option to check your formulae numerically.
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