

MAT 332, SPRING 2009. ASSIGNMENT 5. DUE ON APRIL 7, IN CLASS.

1. Consider the function

$$f(x) = 3x - x^3$$

a) Find all the fixed points and classify their stability. Use Maple to iterate graphically starting at the points $x_0 = 1.9$ and $x_0 = 2.1$. Try to explain the dramatic difference between the two orbits.

b) Find a single orbit of period 2 (use Maple if necessary). Classify its stability.

2. Find examples of a saddle-node bifurcation and a period-doubling bifurcation in a family of one-dimensional maps which are **NOT** covered in the textbook. Give a brief description of your example, and illustrate its properties with a Maple worksheet (**Caution:** identical answers may be considered cheating).

Bonus question – plus 1 point to the final mark. Write a program which computes a first few approximations to the Feigenbaum universal constant δ in the family $f_\mu(x) = \mu\pi \sin(x)$ on the interval $[0, \pi]$.