# (Math 170) Homework 2:

Due January 24, 2007

Exercise 1: Suppose we have the discrete dynamical system $P_n = P_{n-1}^2 - 2$ with $P_0 = 1.99$. Further suppose we have a calculator which rounds all calculations to 2 decimal places. What values will we get for $P_1, \ldots, P_{10}$? What values do we get for $P_1, \ldots, P_{10}$ if instead we have a calculator which rounds all calculations to 4 decimal places? What are the differences between the values? Does this difference grow, shrink or stay approximately the same?

Repeat the same calculations with a starting value of 2.01 (but only calculate up to $P_7$)

Exercise 2: Go to the webpage

http://www.apropos-logic.com/nc/FixedPointIteration.html

Find a function and a starting value such that the path towards an equilibrium point in the spider diagram is a spiral. Print and include with your homework a picture of this diagram.

Exercise 3: Let $f(x) = ax^2 + bx + c$ where $a, b, c$ are real numbers. Verify

(a) When $b^2 - 4ac \geq 0$ $f(\frac{-b+\sqrt{b^2-4ac}}{2a}) = f(\frac{-b-\sqrt{b^2-4ac}}{2a}) = 0$

(b) When $b^2 - 4ac < 0$ $f(\frac{-b+i\sqrt{4ac-b^2}}{2a}) = f(\frac{-b-i\sqrt{4ac-b^2}}{2a}) = 0$ where $i^2 = -1$.