PHYS 210, Assignment 6

Create a new directory somewhere in your home directory with the name `yourusername_assignment_6` to store the files you will create for this assignment. To hand the assignment in, copy the directory with your results to `/home2/phys210/yourusername/`. Make sure it's there and has the right permissions (read and execute for everyone, write for you).

1 Functions III

1. Solve exercises 1-3 from chapter 5 (`http://greenteapress.com/thinkpython2/html/thinkpython2006.html`).
2. Solve exercise 4 from chapter 6 (`http://greenteapress.com/thinkpython2/html/thinkpython2007.html`).

Put the commented code in a file called `functions3.py`.

2 Mandelbrot set I

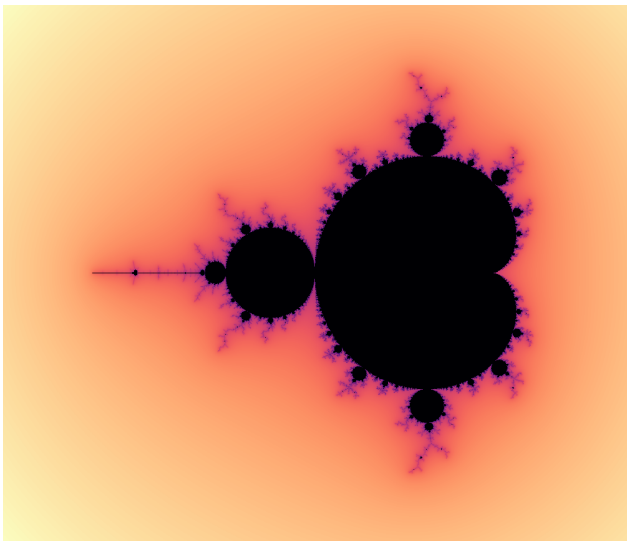

Figure 1: The Mandelbrot set.

The Mandelbrot set M (`https://en.wikipedia.org/wiki/Mandelbrot_set`) is the set of complex numbers c for which the series

$$z_n = z_{n-1}^2 + c \ , \tag{1}$$

with

$$z_0 = 0 \ , \tag{2}$$

does not diverge. Over the next couple of assignments you will learn how to compute the set reasonably efficiently and make graphics such as figure 1.

Write two functions, `in_mandelbrot_recursive` and `in_mandelbrot`, that check whether a complex number c is part of the Mandelbrot set. Implement `in_mandelbrot_recursive` using recursion and `in_mandelbrot` using `while` loops.

The absolute value of a complex number can be checked with the built-in python function `abs` or `numpy.abs`. To check for divergence, it is sufficient to check if $|z_n| > 2$, rather than if $|z_n| \to \infty$. While the set is defined for $n \to \infty$, to get pretty pictures going to some high, but finite, n, is enough, e.g., 1000.

Put the commented code in a file called `mandelbrot1.py`.