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ASSIGNMENT 2: QUESTION 1

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Subject headings: Mandelbrot Set

1. METHODS

To iterate the equation $z_{i+1} = z_i^2 + c$ over the complex plane $c = x + iy$, I defined a function, complexiter, that takes in the maximum iterations allowed, and two numeric sequences, one for x values and one for y values. It runs a for loop within the maximum iterations to iterate the function for z at every point in the complex plane defined by the numeric sequences. It returns an array of of Boolean values, True if iterations at the point remain bounded, meaning the value of z never exceeds the absolute value of 2, and False if the iterations at the point run off to infinity.

2. ANALYSIS

I pass the function for two sets of numeric sequences. One is $-2 < x < 2$ and $-2 < y < 2$ as given in the question and shown in Figure 1. Figure 2 is zoomed in on the section $-1 < x < 0$ and $-1 < y < 0$ where the iterations were rerun.

The image in Figure 1 is gray scaled so that iterations of points that go off to inifity are coloured black and the ones that remain bounded are white.

Figure 2 zoomed in on Figure 1 for the range $-1 < x < 0$ and $-1 < y < 0$ and reran the iterations, giving the same output, the madelbrot set. This output is reasonable because it is a fractal image just recreated for a smaller range on the complex scale.

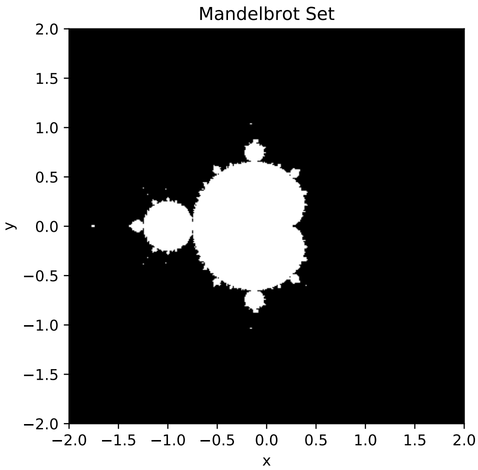

Fig. 1.— The Mandelbrot set plotted for $-2 < x < 2$ and $-2 < y < 2$.

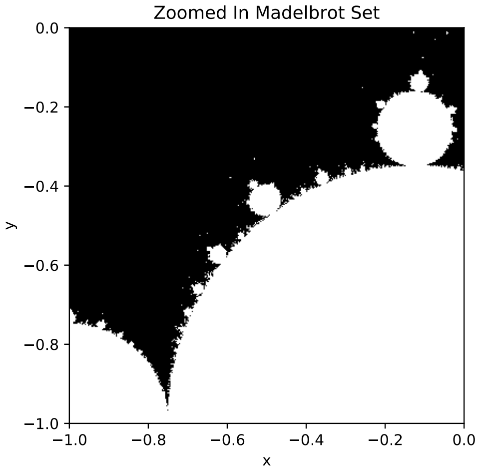

FIG. 2.— The Zoomed in Mandelbrot set plotted for $-1 < x < 0$ and $-1 < y < 0$.