Due Date: February 13th, 2020.
Problems due: 2

1. Complete the in-Class Worksheet
2. Write a function Newtonsp that will use Newton-Raphson method to approximate to within 10^{-4}, the value of x_0 which is the point on the graph of $y = x^2$ that is closest to $(1, 0)$.
3. *Extra Credit*[1]:- Let $\mathbb{C} = \{a+ib : a, b \in \mathbb{R}\}$ be the complex plane. Suppose we implemented Newton-Raphson on the complex plane. Consider $f : \mathbb{C} \to \mathbb{C}$ given by

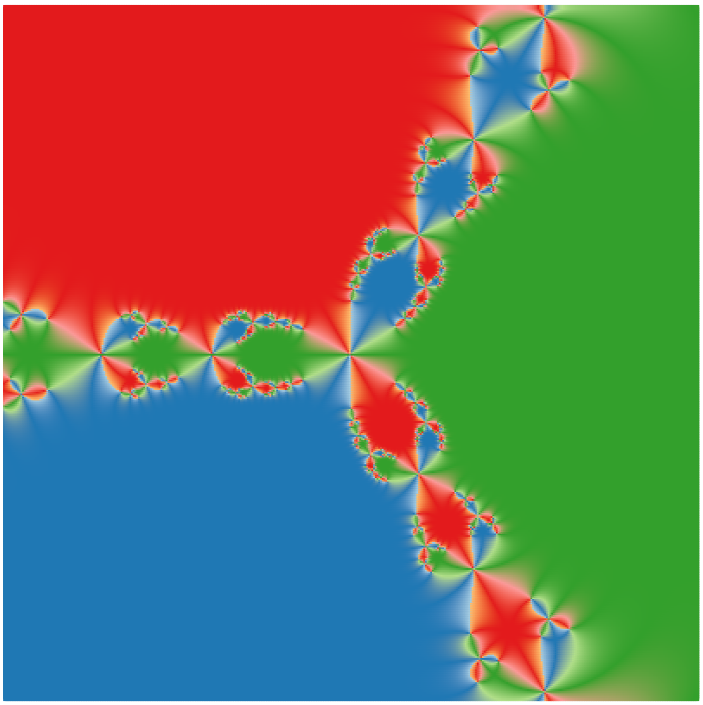
$$f(z) = z^3 - 1.$$

We know that there are three roots of unity in $\mathbb{C}$. One can similarly set up Newtons method in the complex plane by

$$z_0 \in \mathbb{C}, \qquad \text{and} \qquad z_n = z_{n-1} - \frac{z_{n-1}^3 - 1}{3z_{n-1}^2}$$

(a) Using R or otherwise, let $z_0 = 0.539 + 0.471i$ and decide what happens to Newton's method.

(b) Another natural question to ask is that if z_n converges then which root does it converge to ? Can you create this picture using the answer to the question ?



(c) The above picture contains a set called Newton's Fractals. Look for references and write down the definition of a Fractal. Show that the above picture is Fractal with regard to the chosen definition. Where does the set C discussed in the first extra-credit question fit in this framework ?

[1]These are not part of the credit towards this Homework. You may attempt any of them as you feel appropriate and you can discuss solutions with me before writing it up. Selected solutions will be posted on the course website. If attempted with enthusiasm and solutions given precisely then I will bake a chocolate cake at the end of the semester for the class.