Homework 2 Dholakia

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1 Introduction

1.1 Problem 1: Binary

121 in binary is 1111001.

1.2 Problem 2: Madelung Constant

The Madelung constant makes it possible to calculate the total electrical potential of all atoms (ions) in a lattice structure.

This is the potential V felt by a particle at position r:

$V_i = \frac{e}{4\pi\epsilon_0} * \sum(\frac{z_j}{r_ij})$

Whereas the Madelung constant would be calculated as:

$M = \sum(\frac{z_j}{r_ij/r_0})$

So, using a large number of particles representing Na+ and Cl- ions, we can calculate the Madelung constant numerically.

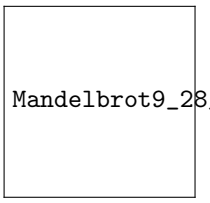
1.3 Problem 3: Mandelbrot Set

Iteration process:

$z = z^2 + c$

The code:

I created a function which returns the Mandelbrot set by iterating through a number of steps for a certain "resolution". The set of the complex numbers, $x_(complex)$ and $y_(complex)$, which obey the condition $z = z^2 + c$ are included in the illustration of the set.



1.4 Problem 4: Quadratic

Since the two numbers are of such different magnitudes, there is an error of approximation in the calculation.