Newton Iteration and Fractals

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Abstract

Contents

1 Introduction

Write a brief description (background/significance) of what the project is about. ====== Fractals are interesting and arguably beautiful representations of the

2 Problem Statement and Assumptions

State fully and precisely the mathematical problem. State any assumptions made for the formulation of the model. Explain meaning of all symbols used. Make clear what is given and what we are looking for.

2.1 Newton Method for Root Finding

Text introducing this subsection. In (INSERT YEAR HERE) Sir Iaasic Newton developed a method for determining the roots of an equation. The pretense is: given an equation and an initial guess for the root, you can iteratively approach the true root of the function.

2.2 Fractals from Newton Iterations

Text introducing this subsection.

3 Method/Analysis

Begin with naming or characterizing the method/approach to be used, perhaps explain the basic idea behind it, to what type of problems it applies, under what conditions, what it achieves, what are its main features, advantages, disadvantages. Justify why it is applicable to this problem, stating clearly any assumptions you need to make about the problem for the method to apply. Name some other methods/approaches one could use, and if/why your method may be preferable.

4 Solutions/Results

4.1 Newton Method

The guess for the root of the function converges onto the true root within 6 iterations when using the Newton Method. Conversely, the bisection method requires 37 iterations to converge. This shows that for the function

$$F(x) = x^3 + x^2 - 3x - 3$$

the Newton method is able to find the root in 1/6th the time required by the bisection method.

Function roots: -1.7320508075688772, -1, 1.7320508075688774

4.1.1 Newton's Cubit

Newton famously used this method to solve only one function known as Newton's Cubit.

$$F(x) = x^3 - 2x - 5$$

Function root: 2.0945514815423265

4.1.2 A further subdivision

Text introducing this subsubsection.

5 Discussion/Conclusions

Interpret your solution physically, what we learn from it, comment on strengths and weaknesses of the solution method, any nice features you want to brag about, possible ways to improve it (e.g. how to make it more accurate, more efficient), as appropriate.

References

[1] Heath, Michael T., Scientific Computing: An Introductory Survey, McGraw Hill, 2002.