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CMPT439 – Numerical Computation

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Final Project Report

Section 1:

For the final project, Kieran OGara and I decided to work on Project 1 – Solving Nonlinear Equations. For the coding portion of the project, my contributions heavily focused on the Secant function and the Newton-Raphson function. For these functions I adapted what I had submitted for the midterm exam, which I had originally adapted from the source code provided on moodle, as well as the frameworks from the Lecture 4 notes. The functions did not need many changes apart from additional comments, renaming variables, and adding an additional parameter to the function call. This new parameter would determine the stopping criterion of the function, one of the three errors required. On top of my contributions of these functions, I also added a graphing function to the main GUI. This graph function allows the user to select the bounds of their graph and see the equation they wish to evaluate before choosing a method and selecting initial guesses. Since Kieran did most of the GUI work, I felt I should put more work into the power point presentation. So, along with the slides for the secant and newt-raph methods, I also wrote the introduction, the slides pertaining to the GUI, and the conclusion.

Section 2:

Secant Method

Absolute Approximate Error

Graphical user interface, application

Description automatically generated

Absolute Relative Approximate Error

Graphical user interface, application, website

Description automatically generated

True Absolute Error

Graphical user interface, application

Description automatically generated

Newton-Raphson Method

Absolute Approximate Error

Graphical user interface, application

Description automatically generated

Absolute Relative Approximate Error

Graphical user interface, application

Description automatically generated

True Absolute Error

Graphical user interface, application

Description automatically generated

For testing purposes, I used the equation y= x^3-7\*x^2+8\*x-0.35. For the Secant method I used x0=-0.5 x1=0.5. For the Newt-Raph method I used an initial estimation of 0.5. The tolerance threshold for all 6 tests was set to 10^(-8). The Newt-Raph method converged the fastest at 6 iterations when using True Absolute Error as the stopping criterion. When using the other two stopping criterions, Abs Approx Error and Abs Rel Approx Error, it converged faster than the secant method at 7 iterations. The secant method was not far behind however, falling one iteration behind for each respective test. All six tests arrived at the same, or close to the same root.