AMS209 HW3, Part2

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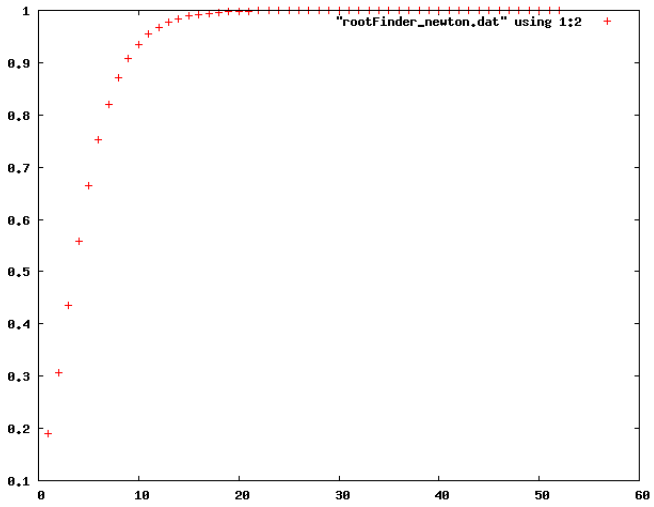
I am providing a summary of results for Part 2 of Homework 3: Newton Method Fortran practice.

1. RootFinder.F90 was modified to print the target function and initial search value by manually inputting corresponding function based on input ftnType.

2. setup_module.F90 was modified to print all the runtime parameters.

3. We can plot our initial value to show that it gets closer to the root of the target function after each iteration. The gnuplot instructions are provided in my git.



4. You do not need t recompile te code everytime we change input runtime parameters. That's why this style of coding is strong. It reads the inputs from the file when the executable is run. Also, the init file isn't even part of the compilation process.

5. After changing definition.h, we need to recompile. That is because there is a dependancy from the Fortran files that include this header file. I went

ahead and actually deleted everything in the file, ran the executable and it still worked like before.

6. If we delete newton and modified_newton from defintion.h and compile after, we see that it doesn't break the code. We have defaults preassigned in the code so that if we do not provide values for these newtons, the code will still works properly.

7. make debug would make it so it checks for possible errors/bugs during compilation. It provides us with the information we need in order to debug our code efficiently.

Note that I also changed the way the derivative was evaluated. Instead of manually inserting a derivative computation, which is bad for generalizing Newton's method, we applied basic numerical differentiation with a predefined h computed as follows:

$$f'(x) \approx \frac{f(x+h) - f(x)}{h}.$$

It follows from the definition of secant line, applying a tiny displacement of .000001.