Homework 4

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AMS 209: Foundations of Scientific Computing
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Problem 1: Website

Website Link = Click Here.

Problem 2: Newton Root Finder

1. In this exercise, I have modified a couple of bits in file '`RootFinder.F90`'. I added a '`ftnType`' to line 34 so the driver file knows which function is being used. This then allows us to print the target function. I added the printing commands between lines 67-79 in '`RootFinder.F90`'.

2. I have added the print commands between lines 57 and 67 in file `setup_module.F90`.

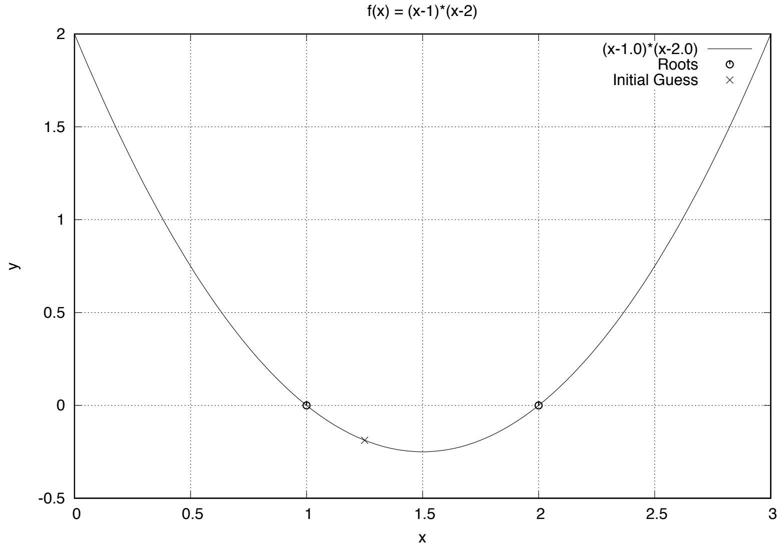
3. For this exercise, we had to plot the target function, roots and the initial guess. It is shown in figure 1.

4. Since all variables are allocated when the code is compiled and the value set when the 'rootFinder.init' is read then there is no need to recompile the code. This is why they are called runtime parameters.

5. I added the functions $f(x) = (x-1)^2(x-2)^2$ and $g(x) = -\frac{\sin x}{x} + 1$. The function f tests the multiplicity of the roots and to see if modified Newton is working properly. While $g(x)$ simply tests whether the code exits when the derivative becomes to close to 0.

6. Changing the values or setting the values equal to each other does not do anything.

Figure 1: The target function $f(x) = (x-1)(x-2)$.



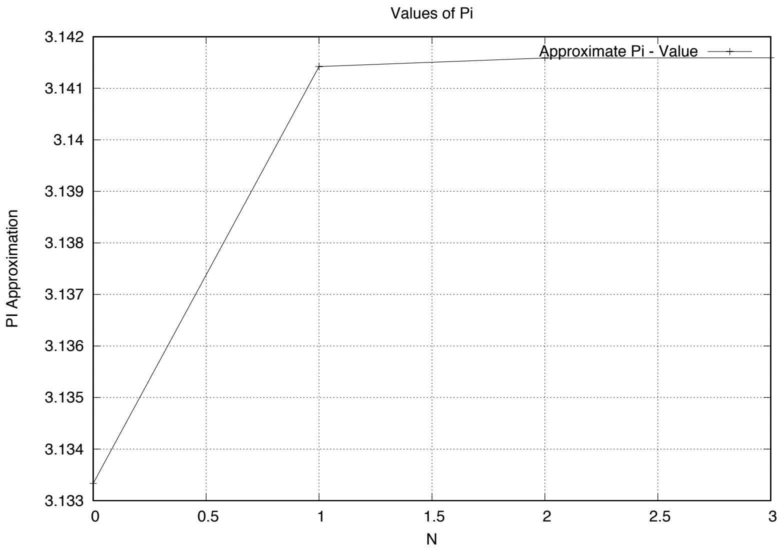
7. Erasing the two definition lines in ‘`definition.h`’ causes no changes in the code. The code still compiles without those two lines of code.

8. The make debug runs ’`FFLAGS_OPT = $(FFLAGS_DEBUG)`’ this command which makes the gfortran flags the debugging flags. Therefore rather than compiling with the optimization flags, it will compile with debugging flags.

Problem 3: π Approximation

For this problem we had to program a modularized version of the π approximation from homework 2. In Figure 2 we show the approximation versus the number of summations.

Figure 2: The approximation of π at each summation.


Values of Pi
Approximate Pi - Value
PI Approximation
N