Homework 4 Report

Group 334-7

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Coding	66.6%	0.0%	33.3%
Results	33.3%	33.3%	33.3%
Report	0%	33.3%	66.6%
Overall	Driver	Navigator	Navigator

Introduction:

In homework 4, we were given the task of debugging a code that was meant to solve a system of linear equations. Many of the flaws within this code were simple, some examples being the misnaming of the program in the end program statement, improper syntax when allocating values to arrays. Some of the more complex problems arose with issues within variable declaration, as well as the general misorganization of subroutines used in the .f90 file.

Procedures:

1. Debug code of compilation errors.
2. Test two different systems of equations of the form $Ax = b$, using both a preassigned A and the transpose of A, denoted A^T.

First System of Equations: $Ax = b$

$$2x + 3y - 1z = 1$$

$$4x + 7y + z = 3$$

$$7x + 10y - 4z = 4$$

Which resulted in $x = 4$, $y =-2$, $z = 1$.

Second System of Equations: $A^T x = b$

$$2x + 4y + 7z = 1$$

$$3x + 7y + 10z = 3$$

$$-1x + 1y - 4z =-10$$

Which resulted in $x =-2.5$, $y = 1.5$, $z = 0$.

Introduction to Problem 3:

In this problem, we were tasked with using our previous program that approximated pi and splitting our program into many different files for organization. The program we created previously used the following series to approximate pi and relate it to our true value of pi, $\pi_{true} = acos(-1.d0)$.

$$\pi = \sum_{n=0}^{\infty} 16^{-n}\left(\frac{4}{8n+1} - \frac{2}{8n+4} - \frac{1}{8n+5} - \frac{1}{8n+6}\right)$$

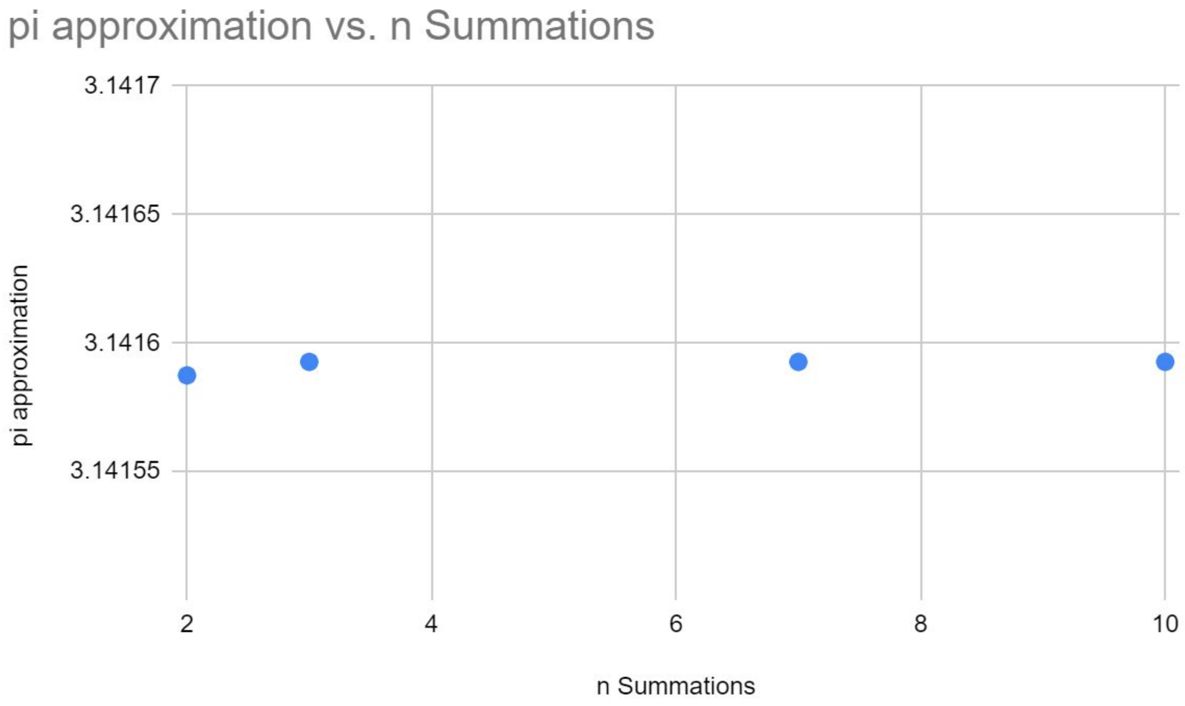
Procedures for Problem 3:

1. Reorganize original pi approximation program.
2. Create a graph that shows our results, pi approximation (y-axis) vs n-summations (x-axis).

Organization of our Program:

1. Setup_module.F90: We use this file to initialize parameters by calling the read_initFile_module.F90 file.
2. read_initFile_module.F90: This reads in and initializes the parameters that are declared in pi_approx.init.
3. Pi_Module.F90: A module that we used to store our pi_summation.F90 file which evaluates our pi approximation.
4. Pi_errorCheck.F90: This file checks and relates our π_{true} and π_{approx} and stops the summation of the series listed above.
5. Pi_writeOutput.F90 which prints important information, such as our N, pi approximate, threshold, and residual.

History of Pi Approximation vs n Summations:



As expected, our result approached pi the larger the value of n became.