

# Assignment 2

## A Little Slice of Pi

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Due May 3rd 2023, 11:59 PM

### 1 Purpose

The purpose of this assignment is to create a program that calculates the value of pi and e using a variety of arithmetic sequences run by a main function.

### 2 Using the Program

In order to use the program, compile and run the file mathlib-test.c. In order to run the program, run `./mathlib-test` and specify the commands in which you want to run. The available options are;

- a; running all tests
- e; runs e approximation test
- b; runs the Bailey Borwein Plouffe pi approximation test
- m; runs the Madhava pi approximation test
- r; runs the Euler pi approximation test
- v; runs the Viète pi approximation test
- w; runs the Wallis pi approximation test
- n; runs the Newton-Raphson square root approximation test
- s; enables printing of statistics to see computed terms and factors for all tested functions
- h; displays a help message detailing program usage.

### 3 Program Design

The main program will be in the file mathlib-test.c, while each of the separate individual sequence tests will be in their respective files. Each separate sequence test will simply be a function which the main mathlib file runs.

### 4 Data Structures

The main data structures will be the usage of for loops to run the sequences an undefined number of times until the margin of error is lower than an epsilon we will define to be  $10^{-14}$ .

## 5 Algorithms

Main Routine:

Using getopt, iterate through the console command and retrieve all the requested commands

Instead of directly running the sequential function when the command is detected, instead use a temporary variable so that we can call them in the expected order.

Run each requested sequence until the margin of error is below  $10^{-14}$

If asked (-s), print the output number and the number of iterations they took.

## 6 Results

The program running

TBA

## 7 References

TBA