

Design Document

Description

- The purpose of this program is to explore and compare ways of calculating mathematical constants without using the built in `<math.h>` library. We want to see how these irrational numbers can be calculated without just relying on built-in programs.
- This program explores and compares different methods of calculating e, pi, and square root based on convergent series. We compare these methods to each other as well as the value given by the `<math.h>` library. Finally, we compare the speed of convergence of these series by calculating how many terms it takes for each of these methods to converge. This is done by terminating the series when the term is below the value defined by Epsilon.

Structure

- **Layout of function to calculate converging series:**

```
static terms = 0;
function (void) {
    sum = 0, term = 1;
    while (term > EPSILON) {
        term = next term in series;
        add term to sum;
        terms += 1;
    }
    return sum;
}
function_terms (void) {
    return terms;
}
```

- Layout of mathlib-test.c:

```
int main (void) {
    read options;
    if (option h OR no test options enabled) {
        print help string;
        return 0;
    }
    for (each test T) {
        if (option T is enabled and T is Newton's test) {
            for (0 to 10 in increments of 0.1) {
                print function calculation, <math.h> calculation,
difference between them;
                if (option s) {
                    print terms;
                }
            }
        }
        else if (option T is enabled) {
            print function calculation, <math.h> calculation,
difference between them;
            if (option s) {
                print terms;
            }
        }
    }
    return 0;
}
```

Inputs and Outputs

This chart shows how the program will handle the selected options when run.

