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Assignment 2 Write Up

In this assignment, I created a program comparing the build-in math functions; *sin()*, *cos(), tan(),* and *exp()*, from the *math.h* library to the functions we have created ourselves in the *math.c* program.

Before starting on the code, it was known that our calculations were not going to be as accurate as the built-in functions of the *math.h* library, how big this difference was going to be the question and is proven when the program runs the tests using the command line.

When running all the tests for the functions made in the program, we found the following: The difference between the *cos()* and *sin()* was pretty significant, with the biggest difference being -0.2723585572. This difference was not seen in the *tan()* and *exp()* functions but there is an explanation for that.

The way *sin()* and *cos()* are calculated is using the Padé approximant, for a 14 term series for those two functions. This causes the calculation to be less accurate because it is an approximation and causes it to be less accurate. Why *tan()* seems to be more accurate is not because a different way of calculating is used this is just because it is using a smaller range, $-\pi / 3$ to $\pi / 3$. I used Padé approximant for my program because it makes it easier to do calculations and it allows us not to use the Taylor series which would make the functions more complicated.

The only reason that the *exp()* function is so accurate because there no other way to calculate it than using the Taylor series. This made our program complicated but using this method for *sin(), cos(),* and *tan()* would have been possible but would have been more difficult.

One way I could have made it more accurate is by increasing the term used but that would have increased the calculations in the functions for *sin(), cos(),* and *tan()*.