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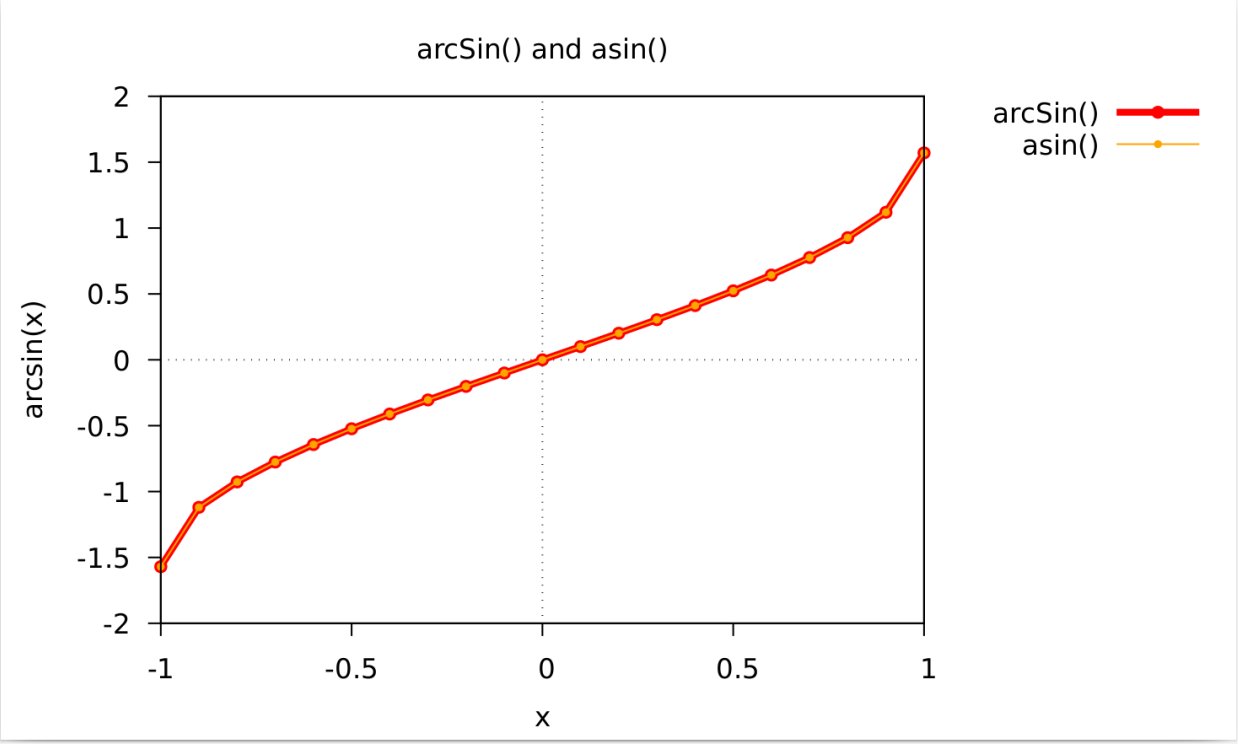
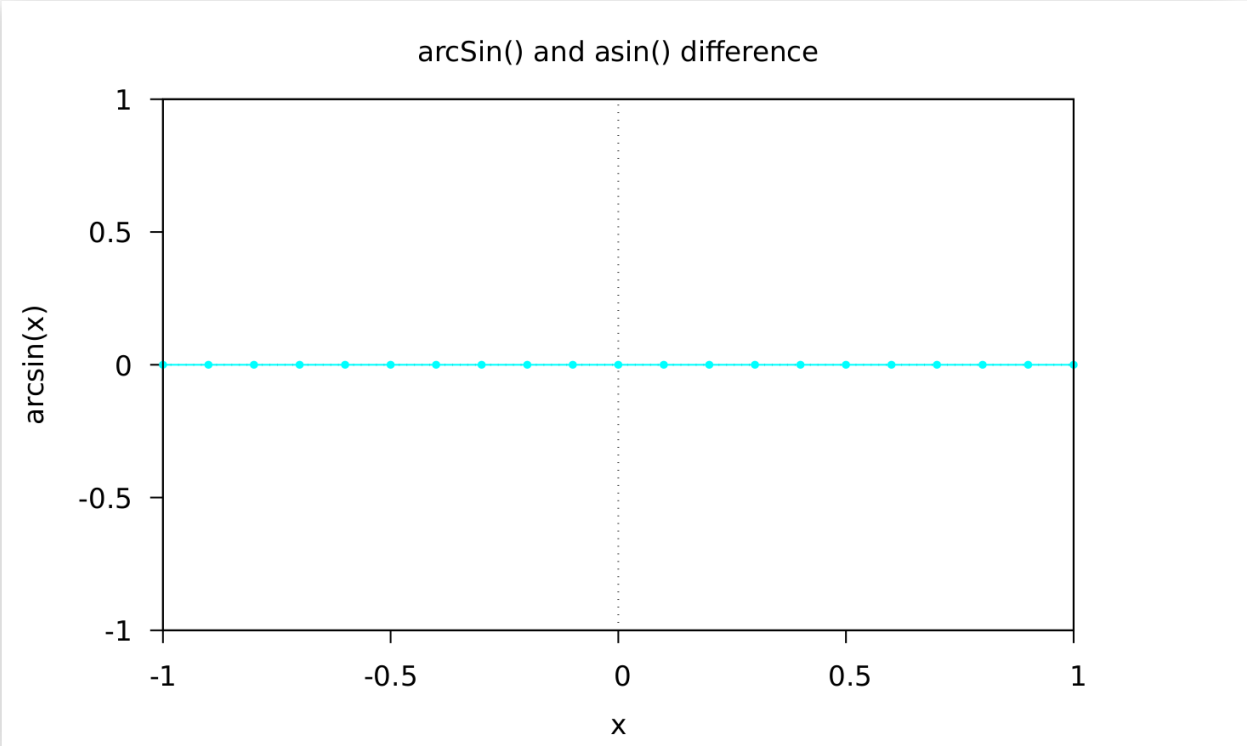
CSE 13s Spring 2021
Assignment 2:
A Small Numerical Library
Writeup Document

After finishing my program there was much difference between my math library and math.h. In order to analyze the difference I am going to show arcsin(x) since most of my other functions used identities related to arcsin(x) in order to solve the problem. An example is arccos(x), in order to figure it out I only had to subtract the result of arcsin(x) with pi/2 which was retrieved from math.h library.

arcSin(x):



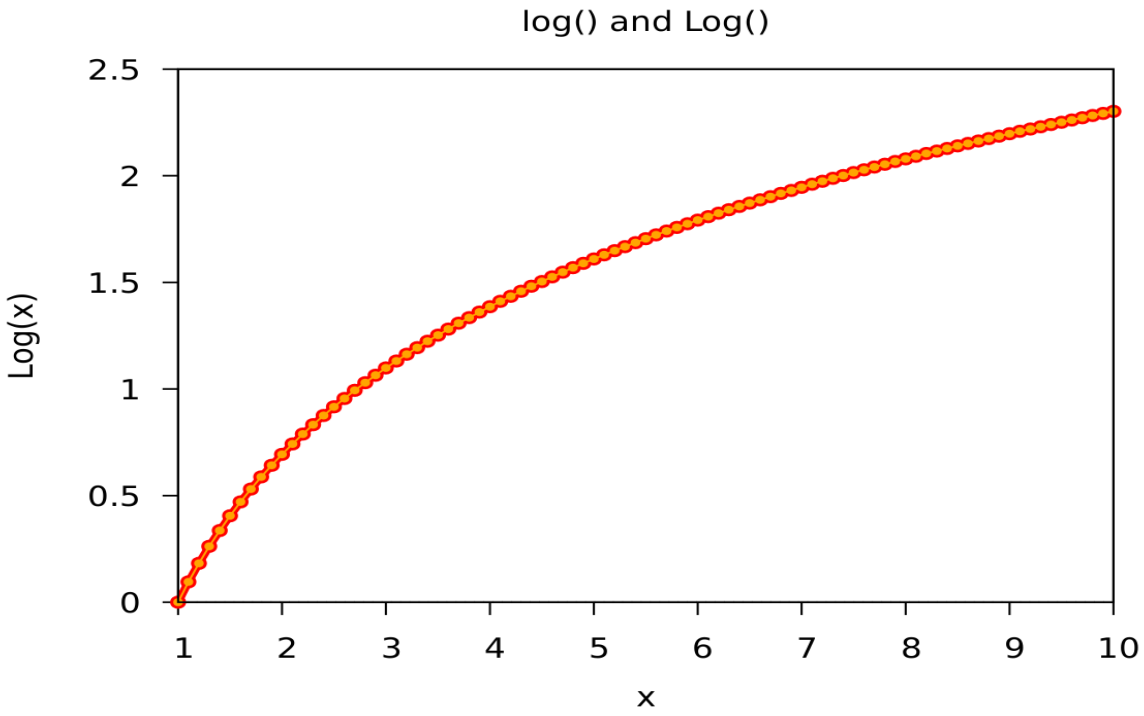
As you can see above my data didn't have much of a difference between the math.h library aSin(X) and my library arcSin(x). If we take a close look at the difference between them: below:



The difference between my arcSin and math.h the difference between them is less than 10e-10 throughout the range -1 to 1. One of the big problems I had previously was that when my function was approaching -1 or 1 it started to lose accuracy but I was able to overcome it by using trig identity shown on piazza which drastically improved my accuracy from 10e-5 to 10e-8 or so. One of the reasons it wasn't able to get any better accuracy was because my EPSILON was too high and it was able to get an accurate result since it stopped my while loop from continuing accumulating the sum using taylor series.

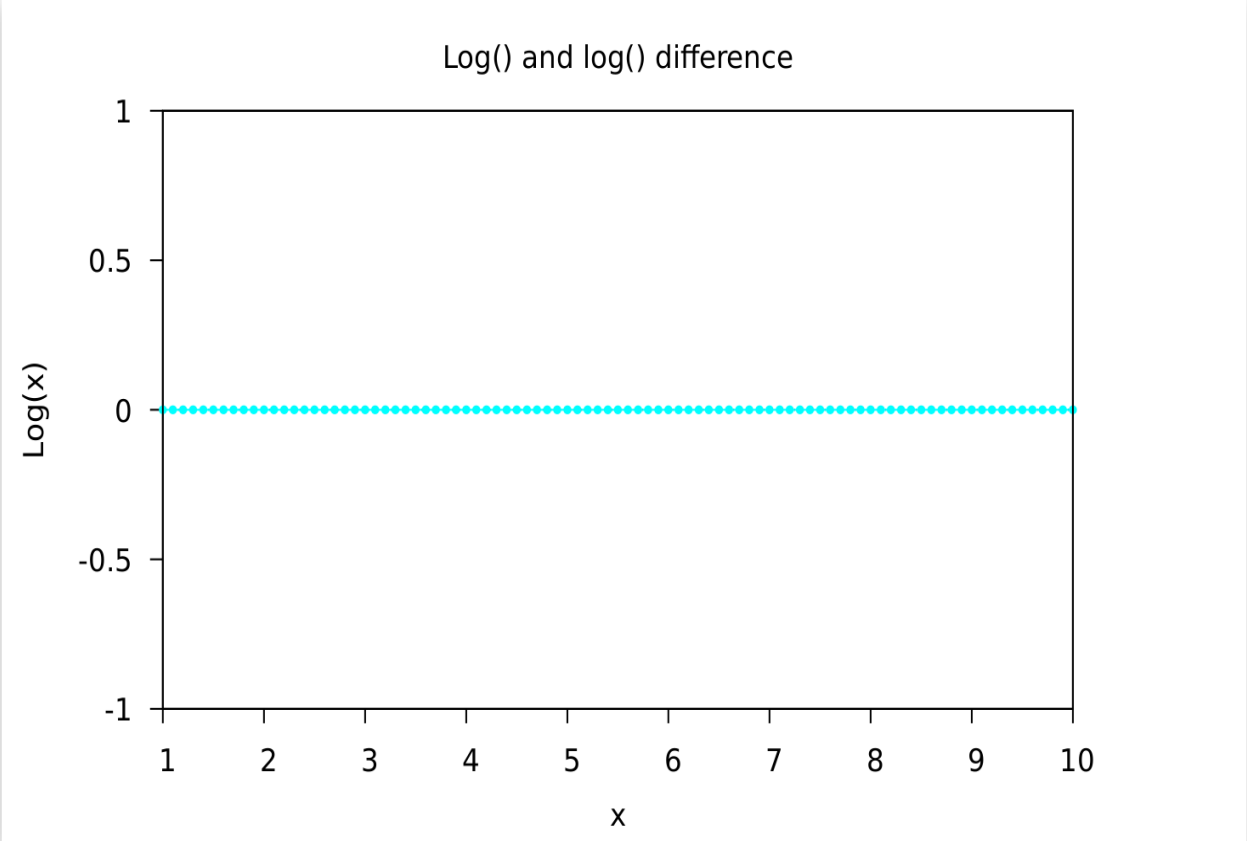
My arctan(x) and arccos(x) were dependent on my arcsin since I was using trig identity. I decided not to show it since it's redundant since the accuracy corresponds with my arcsin function as shown above the accuracy is far higher than 10e-10.

Log:



- The red is Log(x) from my library
- The orange is from math.h, log(x)

As you can see above to the naked eye my log function and math.m function doesn't have any difference. I was able to create my Log(x) function using Newton's Method. This means I used the inverse function of ln(x), e^x and used guesses in order to find the final value.



When we look closer we see the difference between my function and math.h accuracy is below 10e-10 when you look at the data. This means I was able to complete my task on making a function that accurately and completes the assignment.