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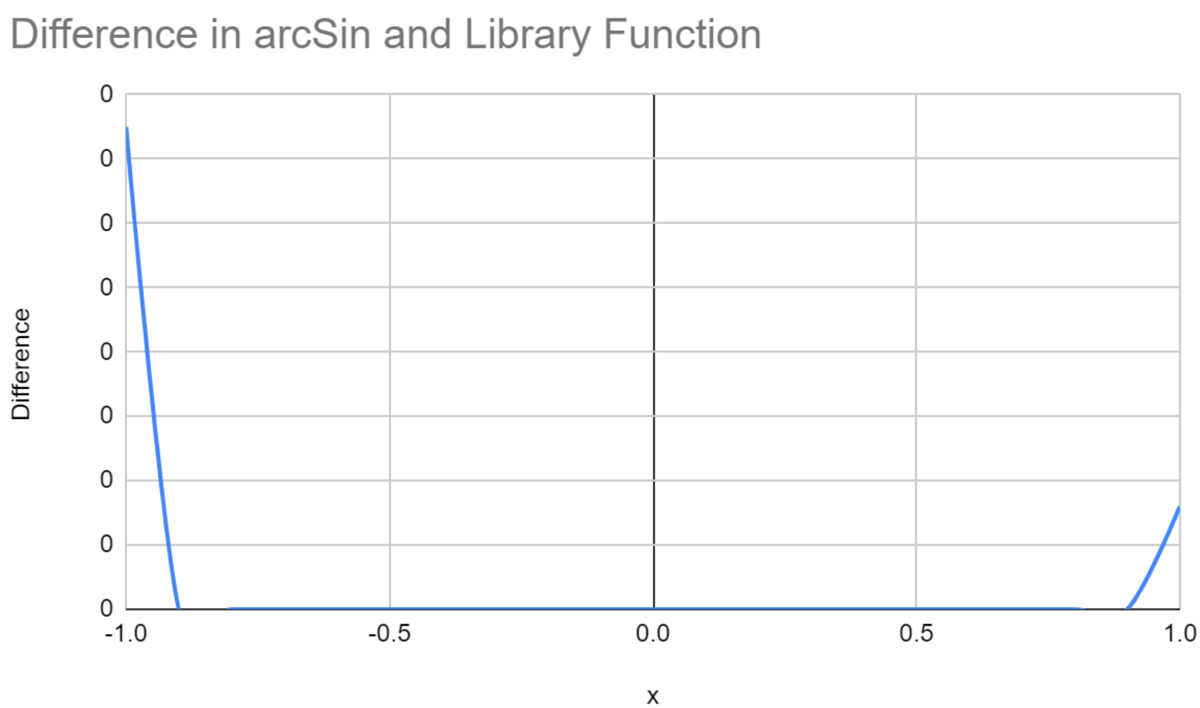
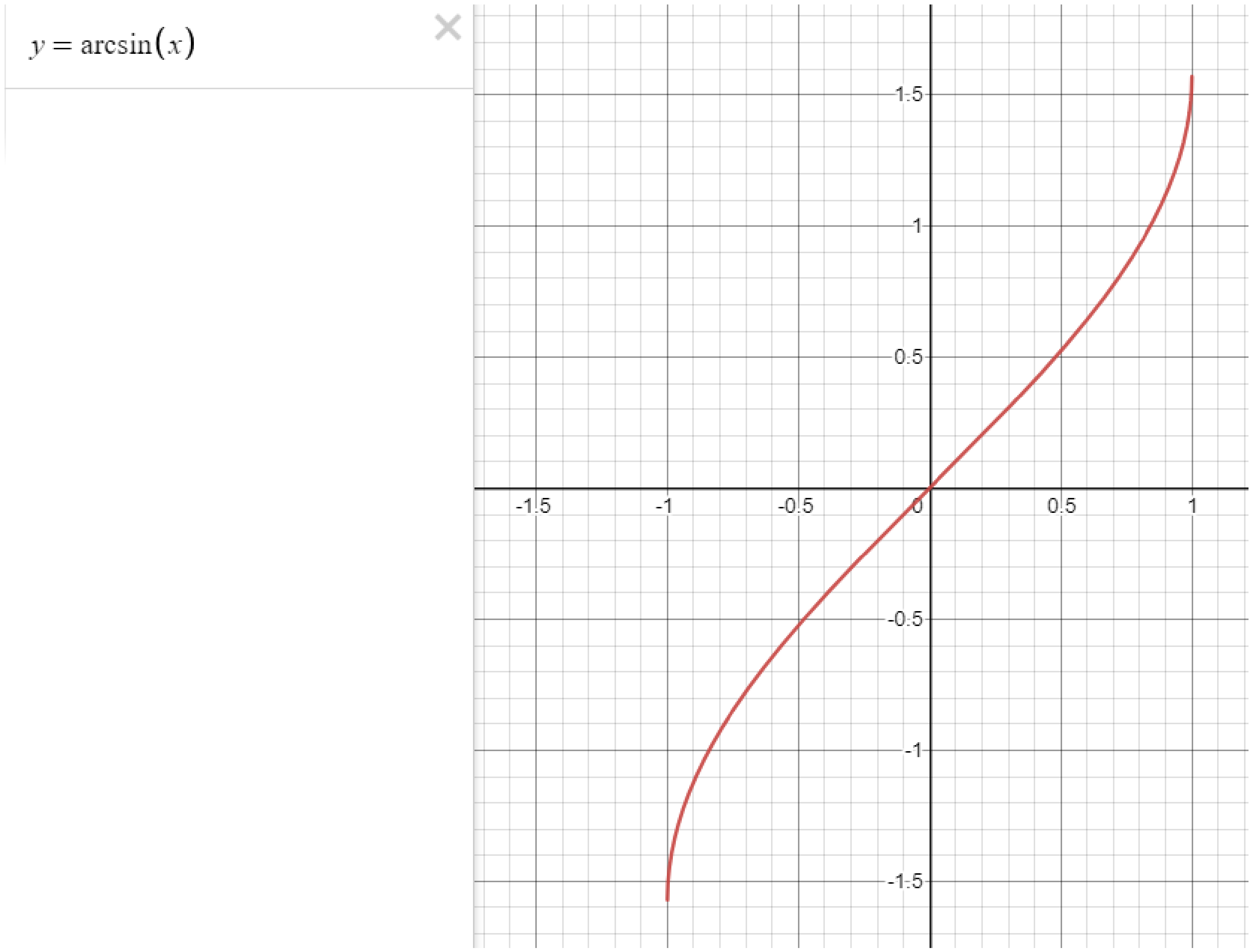
Spring Quarter 2021

Writeup

The outputs for my functions arcSin, arcCos, arcTan, and Log were very accurate within 10 digits of precision after the decimal point. The difference between my function, arcSin, and the corresponding function in the math.h library was never more than 8E-9. This graph plots the difference between arcSin and the math.h function (arcSin(x) - asin(x)), the y-axis is from the range 0 to 8E-9 at the top of the graph (I could not figure out how to make google sheets display the y-axis increments when they were so little).



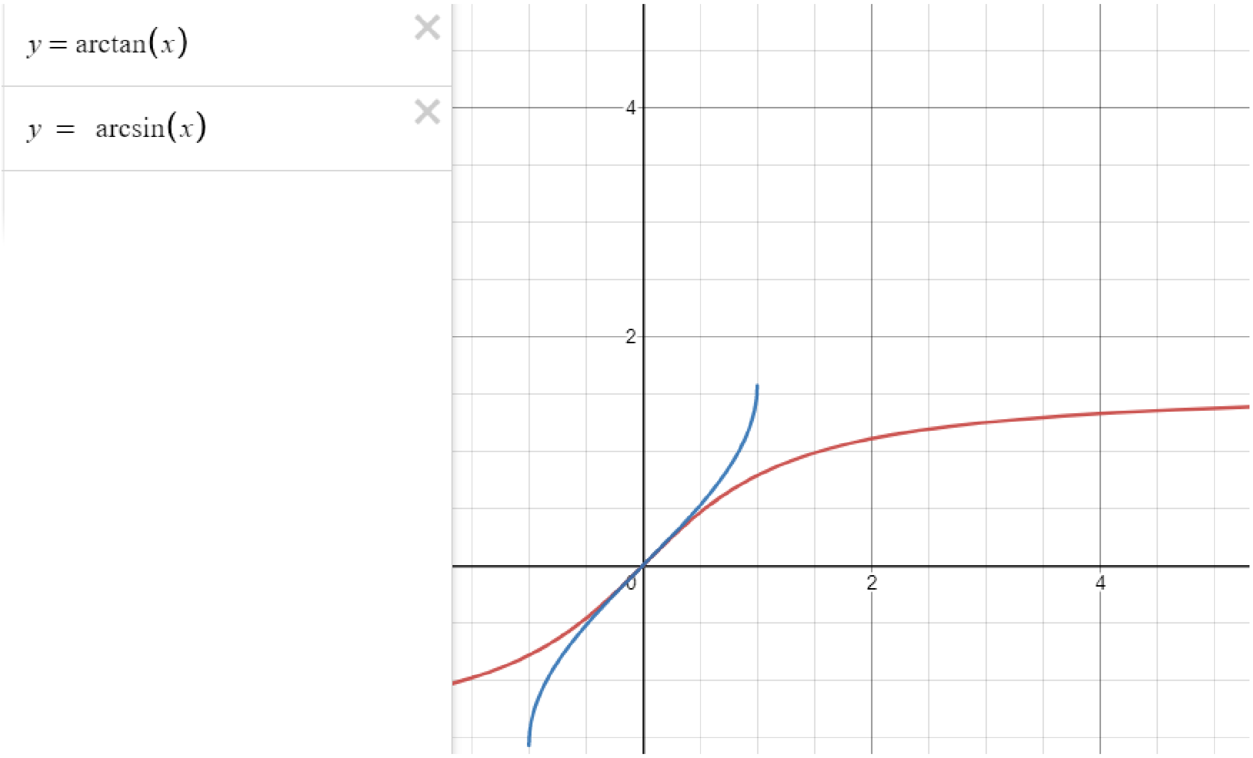
This graph clearly depicts the miniscule difference between the 2 functions except at the beginning and end for the edge cases of x = -1 and x = 1.



This graph of arcsin shows that the derivative or change in arcsin(x) increases dramatically as it approaches the edge of the domain, this most likely contributes to the inaccuracy between my function and the math.h library near the edges of the domain. The actual value of arcsin has a high rate of change near the edges, this probably means that when using Newton's method to approximate arcsin the difference between successive approximations reaches epsilon yet is still inaccurate due to the functions high rate of change near ends of the domain.

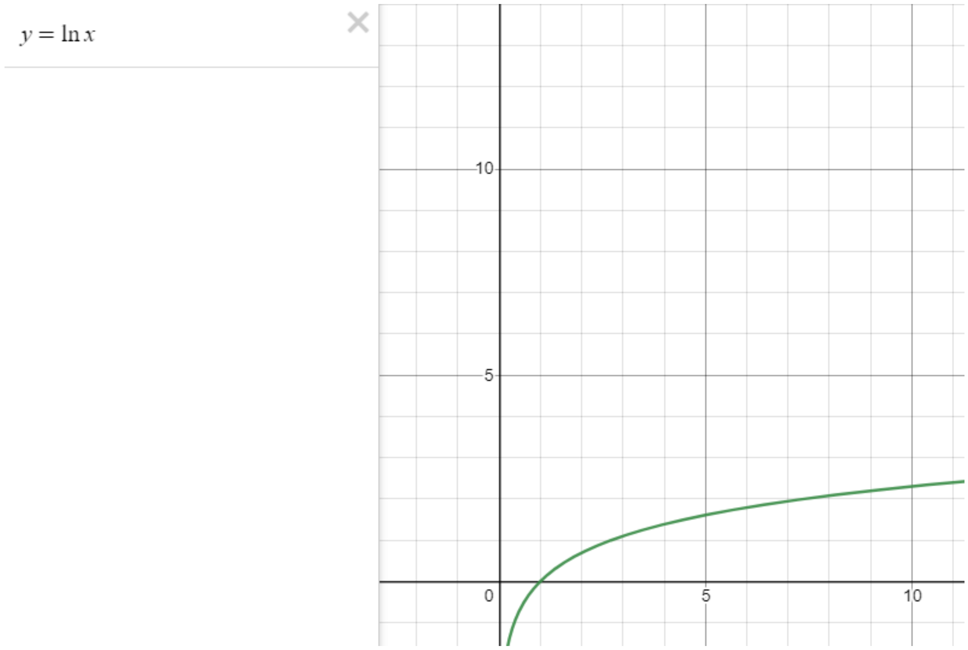
The differences between my function arcCos and the corresponding math.h function mirrors the differences of arcSin and the library function. Within 10 digits of precision after the decimal point the difference between arcCos and acos is only somewhat significant at the edges of the domain. This is most likely due to the implementation of arcCos in my program which is simply the trig identity pi/2 - arcSin, this causes the differences between my arcSin function and arcCos function to be almost identical because it is just my approximation of arcsin subtracted from a constant. This means that however much my arcSin is off from the actual value, arcCos will be off by that same amount.

Within 10 digits of precision of accuracy after the decimal point, the difference between my arcTan function and the corresponding library function in math.h is 0 on the range of 1 to 10. This does not mean my function matches the library function exactly, it just means that if there is a difference it is less than 1E-10.



I believe that this miniscule difference between my function and the library function is caused by the low rate of change or derivative of arctan(x). In the graph of arcsin(x) and arctan(x) shown above, it is clear that the derivative of arcsin(x) begins to increase dramatically when approaching the edges of it's domain, this corresponded to a bigger inaccuracy in my approximation near the edges of the domain. Using the same logic, the graph of arctan(x) stays relatively flat and does not begin to slope up or down dramatically at all throughout the domain of 1 to 10, this agrees with the low rate of inaccuracy of my function along this same domain.

My Log function was also very accurate in that it was never more than 1E-10 away from the value returned by the library function.



Using the same logic as with my arcTan function, I can assume that because the graph of ln(x) is relatively flat on the domain 1 to 10 this may lead to less inaccuracies between the actual value and my approximation. This is further supported by the fact that Newton's method was used to find the approximation of my Log function as was the case with arcSin and arcTan.