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# Assignment 2 - A Small Numerical Library Writeup

The results of the report displayed when the functions sin, cos, tan, and exp were run led to differences between using the implementation that I created for each and the actual function provided by the math library. This was due to the fact that for a taylor series having many terms will result in very accurate approximations and results, which is how the library functions are created. To implement the series I used the 14th term taylor series which then turned into a Pade approximation for the trigonometric functions, improving accuracy and also efficiency of computing of the calculations as it was converted into horner normal form first. However, since this was only for the truncated series at 14th term it did not provide the level of accuracy as closely as the actual library functions. The differences only begin to appear as the input values get further away from 0, which is where the series have been centered at. So right at input value 0 and the values around it have no difference, they appear on the table as having differences of 0.000000000, and begin getting slight differences right towards the edges of the restricted domains. This could have been improved by adding in more terms to the initial series of each of these functions and then taking the Pade approximations of those, in an attempt to closely mirror the library functions. As for the exp approximation, a taylor series was calculated term by term to be used with an epsilon of 1e-9 for comparison of when to limit the number of decimals in the final approximated answer. This, as a result, turned out to improve its accuracy since it led to more terms being in the series, in fact 39 total. So the difference was almost negligible, compared to the differences obtained by the trigonometric functions.