

Exercise 1. Identify for which values of x there is a subtraction of nearly equal numbers, and find an alternate form that avoids the problem. Provide sufficient algebraic detail which shows the equivalence of your expressions.

(a) $\frac{1 - \sec x}{\tan^2 x}$

(b) $\frac{1 - (1 - x)^3}{x}$

Solution.

Computer Problem 1. Using MATLAB, calculate the expressions that follow in double precision arithmetic for $x = 10^{-1}, 10^{-2}, \dots, 10^{-14}$. Then, using an alternative form of the expression that doesn't suffer from subtracting nearly equal numbers, repeat the calculation and make a table of results. Your table should have four neatly formatted columns which show the values of x , E_1 , E_2 , and the absolute error, $|E_1 - E_2|$. The values E_1 and E_2 are obtained by evaluating x with each of the two expressions. Your output will be similar to the table shown on page 18.

Your solution should include all relevant code and the corresponding output.

(a) $\frac{1 - \sec x}{\tan^2 x}$

(b) $\frac{1 - (1 - x)^3}{x}$

Solution.