LE 230 Homework : Introduction

Please show all details of your solutions.

1-1 Find Taylor's series expansion around $x=0$ for the following functions:

    (a) $\sinh(x)$ (b) $\cosh(x)$ (c) $\tanh^{-1}(x)$ (d) $\tan^{-1}(x)$ (e) $\ln(1+x)$

1-2 Write MATLAB code to evaluate the following sums:

    (a) $S_n = \sum_{k=1}^{n} \dfrac{1}{k}$ (b) $S_n = \sum_{k=1}^{n} \dfrac{1}{k^2}$ (c) $S_n = \sum_{k=1}^{n} \dfrac{1}{k^3}$

where n is a variable. Then plot the sum as a function of n.

1-3 Write MATLAB functions to calculate the Taylor's series in 1-1 with variables x and n, the number of terms.

1-4 Use the code written in 1-3 to evaluate the functions when $x =$

    (a) 1   (b) 3   (c) 6,

compare the results with those obtained from MATLAB built-in functions, and plot the absolute error as a function of n.

1-5 Find Taylor's series expansion around $x=0$ for the following functions:

    (a) $\sqrt{1-ax}$ (b) $(1-ax)^{-1/2}$

Then write MATLAB functions to calculate both functions. Finally, evaluate $f(x) = (1-ax)^{-1/2}$ with $a=\{0.5, 1, 2\}$ and $x=0.1$ using (a), (b) and MATLAB built-in function *sqrt*. Plot the absolute error as a function of n.

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