ISTANBUL TECHNICAL UNIVERSITY
MAT 202E - NUMERICAL METHODS
Homework-I

Due 4th March, 2019

1. The floating point numbers between 1 to 2 in the binary form of 5 bits are given as $\left(1. a_1\, a_2\, a_3\, a_4\, a_5\right)$

   a) Find the floating point representations of $x = \frac{13}{7}$ and $y = \frac{11}{6}$

   b) Convert z=x+y in to the decimal number.

2. Derive the fifth order Taylor polynomials around $a = 0$ for the following functions

   a) $f(x) = \ln(x)$

   b) $f(x) = \sin(x)$

   c) Write a MATLAB code for a) and b). Evaluate the code for the values of $x = 0.5, 1.94, 2.0$ and 2.1. Check how accurate your results are.

3. Let $f(x) = x^5$, determine the first, third and fifth order Taylor polynomials approximation around a for $x = 1$, for the each of the following cases:

   a) $a = 0$

   b) $a = 0.5$

   c) For the each cases of a) and b), calculate the error and relative error.

   d) Write a MATLAB code for a) and b) to verify your results.

4. Determine the first order derivative of $f(x) = x^3 + 2x^2 - x + 3$ for $x = 1$ at $h = 0.1$ using the following differentiation methods

   a) Forward differencing

   b) Backward differencing

   c) Center differencing

   d) Write a MATLAB code to verify your results in a), b) and c).

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*Please do your homework on your own and upload your assignment as a compressed file (.zip or .rar) containing all MATLAB code, figures (.m ve .fig) with report files (.pdf) to Ninova.