



ITU, Department of Computer Engineering
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Numerical Methods Assignment 2

Due Date: 14.12.2014, **Monday**, 23.00

- Plagiarized assignments will be given a negative mark.
 - **No late submissions** will be accepted.
 - The written MATLAB codes should be included in the submitted report.
- Submissions:** Please submit your report and your MATLAB codes through NiNOVA e-Learning System.

1. (50 points) The values of exchange rate for Brazilian Real (BRL) and United States Dollar (USD) has been given in the file “dataset.txt”. This file contains the values of exchange rate between USD and BRL since March 2008. In this homework, you need to estimate behavior of the exchange rate by using the defined regression analysis. Estimated value for each day will be represented as a function of the seven predecessor days.

$$y'_n = a_1 y_{n-1} + a_2 y_{n-2} + a_3 y_{n-3} + a_4 y_{n-4} + a_5 y_{n-5} + a_6 y_{n-6} + a_7 y_{n-7}$$

where y'_n and y_n are the estimated and the actual value of the n^{th} day respectively.

First, you need calculate coefficients for the given equation by using Least Square Approach. The given dataset contains 1526 values, but in order to calculate the coefficient you need to use first one thousand values. After you have acquired the necessary coefficients you are asked to do the defined comparisons as follows;

- a. You need to plot the lines which represent actual and estimated values of the first one thousand days and calculate the mean square error (MSE) between these two lines.
- b. In the second part of question, the estimation has to be applied to the test dataset (the last 526 days) dataset by using the coefficient which acquired from the first one thousand day and again you need to plot the lines which represent actual and estimated values of the test data set and calculate the mean square error (MSE) between these two lines.
- c. Compare the MSEs from the sub-question **a** and **b**, explain your answer briefly.

2. (30 points) Evaluate the given integral by using Simpson's 1/3rd rule for $h = 1$ and $h = 0.5$ (h represents the size of each interval.)

$$\int_0^4 \frac{dx}{1+x^2}$$

Compare the results with the actual value and calculate the error for both h values.

3. (20 points) The observed values of the function $f(x) = 3^x$ are given below. Evaluate the $f(5)$ by using Newton's divided difference formula.

x	1	3	4	6	7
$f(x)$	1	27	81	729	2187

Explain briefly why the estimated result differs from 3^5 ?