MAT202E – Numerical Methods in CE

Spring 2017

Homework 3

Assignment Date: 20.04.2017
Due Date: 04.05.2017 - 23:59
Duration 2 weeks

- You should prepare an e-report and submit a .zip archive that contains your matlab or octave codes, e-report and other requested materials. You will submit your assignment through Ninova.
- Late submissions will not be accepted.
- This is an individual assignment, you should do it on your own. Plagiarism will not be tolerated.

0. Data

x	y
1	2
2	1
3	3
5	-4

n=4

1. Monomial Interpolation (20 points)

Calculate a polynomial that interpolates with the data given in **0.** using monomial interpolation.

$$v(x) = \sum_{j=0}^{n} c_j \Phi_j(x) = c_o \Phi_o(x) + \dots + c_n \Phi_n(x)$$

a) Calculate constants and show every step you did in your e-report.
b) Write a matlab or octave code that calculates monomial interpolation with any given number of data. Plot the result. Compare your results with **a.**

2. Lagrange Interpolation (30 points)

Calculate a polynomial that interpolates with the data given in **0.** using Lagrange interpolation.

$$L_i(x) = \prod_{j=0, j \neq i}^{n} \frac{x - x_j}{x_i - x_j} \quad i = 0, 1, \dots, n$$

$$p_n(x) = \sum_{j=0}^{n} f(x_j) L_j(x)$$

a) Calculate Lagrange polynomial of degree n and show every step you did in your e-report.
b) Write a matlab or octave code that calculates Lagrange interpolation with any given number of data. Plot the result. Compare your results with **a.**

3. Newton Interpolation (30 points)

Calculate a polynomial that interpolates with the data given in **0.** using Newton interpolation.

$$p_n(x) := c_0 + c_1(x - x_0) + c_2(x - x_0)(x - x_1) + \dots$$
$$+ c_n(x - x_0)(x - x_1) \dots (x - x_{(n-1)})$$

a) Calculate Newton polynomial of degree n and show every step you did in your e-report.
b) Write a matlab or octave code that calculates Newton interpolation with any given number of data. Plot the result. Compare your results with **a.**

4. Comparision of the Algorithms (20 points)

Compare the algorithms on the top about their pros and cons. Use real results from the matlab or octave codes you wrote.

For questions you can contact:
Abdullah Cihan AK
akab@itu.edu.tr