**INTRODUCTION TO SCIENTIFIC COMPUTING**

1. Python programming assignment:
   * Create random 50x50 matrix A and random 50x1 vector b. Solve this linear system of the form Ax=b for unknown vector x, and measure the elapsed times by using
   1. symbolic LU
   2. symbolic inverse of A
   3. numeric LU
   4. numeric inverse of A.
2. In CENG327, students show the following performance in the class according to the number of absent hours in the semester.

| Absent Hours | Grade |
| --- | --- |
| 1 | 90 |
| 6 | 80 |
| 8 | (75 - ) |
| 12 | 40 |

Find the grade of a student who missed 10 hours using

1. Linear Interpolation
2. Quadratic Interpolation
3. Cubic Interpolation

For c) part you need to construct a linear system of equations in the form of Ax=b, where A is the coefficient matrix and x is the unknown vector. Then, you must find LU factorization of it and explicitly show the L and U parts. To solve the system, you should use L and U factors by using forward and backward substitutions.

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For example, for the student with id=190013123, therefore, this student should solve the question for 75 - 4.6 = 70.4 at hour=8.

Write corresponding python codes for the above interpolation functions by using the python built-in interp1d in Question-1 and find the value at hours=10. Check the correctness of your answers with the outputs of these codes. Then, plot all the above interpolation functions on the same figure for 100 evenly spaced points in the interval of [1,12]. Add a suitable **legend** in the plot for describing the functions.

1. In this assignment, you will implement Bisection and Secant methods in Python to find out one of the roots of the following function for the interval [-3,0]. (use the same in the first question)

1. Write your own python function for Bisection Method. This function returns an approximation of the root for the function f above. You must obey the declaration of the function as follows:

**def my\_bisection(f,a,b,maxiter)**

where **f** is the function, **a** and **b** are starting and ending points of the interval, and **maxiter** is the maximum number of iterations for the bisection method.

1. Write your own python function of the Secant method for an estimation of the root of the f() function above.

**def my\_secant(f,a,b,maxiter)**

For parts a) and b) you must plot a figure where the x-axis is the number of iterations from 1 to 20, and the y-axis corresponds to an estimation of the root values for 2 different methods.