The programming project will be submitted through METU-Class, as described in the "Programming Project Assignment Guidelines", which is posted on METU-Class.

Given $n + 1$ data points $x_1, x_2, \ldots x_{n+1}$ and corresponding function values $y_1, y_2, \ldots y_{n+1}$, it is desired to fit a cubic spline $S_k(x)$ for each interval.

Let the equation of the k-th spline is defined by the following polynomial.

$$S_k(x) = s_{k,1} + s_{k,2}(x - x_k) + s_{k,3}(x - x_k)^2 + s_{k,4}(x - x_k)^3$$

where $s = [s_{k,1} \quad s_{k,2} \quad s_{k,3} \quad s_{k,4}]^T$ are the unknown coefficients.

- Express the problem in matrix form as $As = b$ where s is the unknown coefficients.
- Write a computer program that forms A and b matrices and solves for s.
  The input of your program should be $x = [x_1 \quad \cdots \quad x_{n+1}]^T$ and $y = [y_1 \quad \cdots \quad y_{n+1}]^T$ arrays.
  The output should be $n \times 4$ coefficient matrix in the form of

$$C = \begin{bmatrix} s_{1,1} & s_{1,2} & s_{1,3} & s_{1,4} \\ \vdots & \vdots & \vdots & \vdots \\ s_{k,1} & s_{k,2} & s_{k,3} & s_{k,4} \\ \vdots & \vdots & \vdots & \vdots \\ s_{n,1} & s_{n,2} & s_{n,3} & s_{n,4} \end{bmatrix}$$

Notes:

You are limited with the given polynomial description; any other forms will not be graded.

Your program should read the x and y arrays from a given "input.txt" file, output the coefficient matrix C on screen and plot the x-y points and the splines (between the end points).
A sample "input.txt" is attached.

You may use readily available equation solvers.