CS 3320 – Numerical Software
Module 11 Homework

1. (10 pt) Use a 5th order interpolating polynomial to estimate y at $x = 3.5$. In your answer, please show the interpolating polynomial. You can use Python library to find the interpolating polynomial.

x	0	1.8	5	6	8.2	9.2
y	2.6	16.415	5.375	3.5	2.015	2.54

2. (10 pt) Given the data:

x	1	2	2.5	3	4	5
$y=f(x)$	0	5	7	6.5	2	0

   a. Plot the data and estimate $f(3.4)$ from the plot. (You can use excel to plot the data.)
   b. Calculate $f(3.4)$ using Newton Interpolating polynomial of order 1. (Do this by hand. Also, you only need two data point for order 1 interpolation. Make sure you pick the right points)
   c. Calculate $f(3.4)$ using Newton Interpolating polynomial of order 5. (Do this by hand. Use finite divided differences to find the coefficients for each Newton interpolating polynomial.)

3. (10 pt) Given the data:

x	1	2	3	5	6
$y=f(x)$	4.75	4	5.25	19.75	36

   Estimate $f(4)$ using Lagrange polynomials of order one and three. (Do this by hand.)

4. (10 pt) Given the data.

x	1	2	2.5	3	4	5
y	1	5	7	8	2	1

   Fit these data with (a) cubic splines with natural end conditions, (b) cubic splines with not-a-knot end conditions. Present comparative plots of 50 equally spaced interpolation points over the domain $1 \leq x \leq 5$. You may use Python for this problem. However, make sure you understand the definition of cubic spline and the various end conditions.