1. Given

x	5	10	15	20	25	30	35	40	45	50
y	17	24	31	33	37	37	40	40	42	41

   Use least square regression fit the given data by
   a. A straight line
   b. A power functions
   c. A saturation growth rate
   d. Using a parabola
   e. Plot the data along with the curve and find the correlation coefficient for each of the above cases.

2. For the following data shown below fit the data based on appropriate least square method. (Note that the two independent variables are X and Y)

X	18.2	18	17.9	18.7	18.9	19.4	19.5	19.3	20
Y	7.4	8.8	9.4	7.8	8.4	9.8	7.6	8.6	9.6
Z	0.192	0.211	0.215	0.202	0.209	0.231	0.202	0.216	0.231

3. Given

X	1.6	2	2.5	3.2	4	4.5
f(x)	2	8	14	15	8	2

   a. Using newton interpolating polynomial for n=1,2 and 3 find the polynomial (choose the data starting from the left)
   b. Determine the error to question (a) for the degree of Rn_2
   c. From the given data construct one interpolating polynomial of degree n=3 using lagrange interpolating polynomial method.
   d. Investigate the error for the lagrange polynomial approximation of degree Rn_2 and compare it with answer on (b)
   e. For the given data construct the quadratic and cubic spline.

4. Given the data:

X	0.84	0.92	1.00	1.08	1.16
f(x)	0.431711	0.398519	0.367879	0.339596	0.313486

   Calculate the second derivative f'' (1) as accurately as you can.

5. Evaluate the integral of the following tabular data with
   a. The trapezoidal rule and
   b. Simpson's rules.

x	-2	0	2	4	6	8	10
f(x)	35	5	-10	2	5	3	20

6. Find the equation of the least squares line and the coefficient of correlation for the data shown:
7. A hospital conducted study to determine relation between age and blood pressure of their

x	3	5	7	8
y	8.7	7.9	6.2	5.8

patients. The table below shows collected data. Find the equation of the least squares line and use it to calculate blood pressure of a 50 years old patient.

Age x	43	48	56	61	67	70	
Pressure y	128	120	135	143	141	152	

8. A researcher wishes to see whether there is a relationship between number of hours of study and test scores on exam, so she collected data shown in the table below. Find the equation of the least squares line and use it to calculate how many hours should a student study to obtain 93 percent on the test.

Hours of study	6	2	1	5	2	3
Score on test	82	63	57	88	68	75

9. The table below compares rents for one-bedroom and two-bedroom apartments in 7 different cities. Find the equation of the least squares line and R square. A one-bedroom rent in a doorman building in Lower Manhattan averaged $3000 in august 2007. Calculate a two-bedroom rent using the obtained formula.

One-bedroom rent	782	486	451	529	618	520	845
Two-bedroom rent	1223	902	739	954	1055	875	1455

10. Thanks to the progress of science the cancer survival rate is improving over time. The table shows 10-year survival rate for ovary cancer in England, diagnosed in year 1971, 1981, 1991 and 2001. According to the table 27% of the patients diagnosed in year 2001 survived over 10 years. Find the equation of the least squares line and R square. Use it to estimate the 10-year ovary cancer survival rate for the patients who are diagnosed in year 2015.

diagnosis year	71	81	91	101
percent lived over 10 years	18	22	25	27

11. Given

X	1.6	2	2.5	3.2	4	4.5
f(x)	2	8	14	15	8	2

   a. Using newton interpolating polynomial for n=1,2 and 3 find the polynomial (choose the data starting from the left)
   b. From the given data construct one interpolating polynomial of degree n=3 using Lagrange interpolating polynomial method.
12. The strength of blocks produced for building construction is highly depends on the proportion of cement and sand. The following data shown below in the table indicates the proportion of cement,

sand and the corresponding block strength in Mpa. Using an appropriate least square method generate the relationship of cement and sand proportion versus the concrete strength.

Strength, Mpa	1.88	1.97	2.25	2.23	3.45	2.75	3.97	2.78	3.14
Cement	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2
Sand	2.5	2.35	2.20	2.06	1.94	1.82	1.61	1.50	1.25

13. Rain fall intensity Vs height of flood on the river data used for design of bridge pillar height is given in the table below. Find the equation of the Newton divided-difference interpolating polynomial that passes through each data point and use it to estimate the height at rain fall intensity of 5.5 cm. (20%)

No	RF intensity (cm)	Ht of flood (m)
1	2.5	5.1
2	3.4	9.6
3	4.3	14.5
4	6.8	18.8

14. Evaluate the following integral:

$$\int_0^4 1 - e^{-2x}\, dx$$

a. Analytically
b. Single application of trapezoidal rule.
c. Multiple application of trapezoidal rule with n=2 and n=4.
d. single application of Simpson 1/3 rule
e. Multiple application of Simpson 1/3 rule with n=4.
f.   Single application of Simpson 3/8 rule.