Tutorial 2 &3: Numerical Methods Interpolation & Curve Fittings

1. Using Lagrange interpolation. Find the value of y at x=10 from

X	9	3	1
Y	6	5	12

2. Find the value of y at x = 0 given some set of values (-2, 5), (1, 7), (3, 11), (7, 34) by Lagrange Interpolation Method.
3. The age and height of the Students in a school are given below. By using Lagrange Interpolation method. Find the height of the student whose age is 13 and 15

Age(years)	1	5	7	9
Height(cm)	80	95	105	125

4. How interpolation differs from regression? Write down algorithm and program for Lagrange interpolation.
5. Define the terms interpolation and extrapolation. Write down the algorithm and program for Newton's divided difference interpolation.
6. What is Newton's interpolation? Obtain the divided difference table from the following data set and estimate the f(x) at x = 2 and x = 5.

x	3.2	2.7	1.0	4.8	5.6
f(x)	22.0	17.8	14.2	38.3	51.7

7. Find solution using Newton's Forward Difference Formula as well as Newton's Backward Formula find the value at x=1895 and 1935

x	1891	1901	1911	1921	1931
f(x)	46	66	81	93	101

8. Find the Solution using Newton's Forward Difference as well as Newton's Backward Formula at x=-1

x	0	1	2	3	4
f(x)	1	0	1	10	11

9. Find the Solution using Divided Difference Interpolation formula at x=301 and 309

x	300	304	305	307
f(x)	2.4771	2.4829	2.4843	2.4871

10. Find the Solution of an equation x^3-x+1 using Divided Difference Formula x1=2 and x2=4 x=3.8 step value (h)=0.5.Find f(2).

11. Construct Newton's backward difference table for given data points and approximate the value of f(x) at x=45.

x	10	20	30	40	50
f(x)	0.985	0.934	0.866	0.766	0.643

12. Fit the quadratic curve through the following data points and estimate the value of f(x) at x=2.

x	1	3	4	5	6
Y	2	7	8	7	5

13. How spline interpolation differs with the Langrage's interpolation? Estimate the value of f (0) and f(4) using cubic spline interpolation from the following data.

x	-1	1	2	3
f(x)	-10	-2	14	86

14. Fit the quadratic function for the data given below using least square method.

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Y	2.7	4	5.8	8.3	11.2	15	19

15. What is linear regression? Fit the linear function to the following data

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
Y	2.0	2.6	3.9	6.0	9.3	15	20.6	30.4

16. Construct Newton's forward difference table for the given data points and approximate the value of f(x) at x = 15.

x	10	20	30	40	50
f(x)	0.173	0.342	0.5	0.643	0.766

17. Fit the curve $y=ae^{bx}$ through the following data points.

x	1	2	3	4
Y	1.65	2.70	4.50	7.35

18. The fit function of type y = a + bx for the following points using the least square method.

x	-1	1.2	2	2.7	3.6	4
f(x)	1	20	27	33	41	45

19. Fit the curve $y=ae^{bx}$ through the following data points.

x	1	3	5	7	9
Y	1.0	0.891	0.563	0.447	0.355

20. Find the Langrange interpolation polynomial to fit the following data and find value of y(10).

x	5	6	9	11
f(x)	12	13	14	16

21. Estimate the value of y (1.5) and y' (2) using cubic spline interpolation from the following data.

x	5	6	9	11
f(x)	12	13	14	16

22. Estimate the value of y (1.5) using cubic spline interpolation from the following data.

x	1	2	3	4	5
f(x)	0	1	0	1	0

Note:

1. Hand written/Computer typed Numerical work shall be submitted by 26th of Kartik 2081(11th November 2024).
2. Algorithm and Python/C++ or C (Python Preferred) Code shall be submitted by 3rd of Mangsir 2081.
3. Copying of other's work shall be disqualified for marking.
4. Plagiarism shall be less than 25%.Above 25% will lead to marks deduction. Plag above 50% shall be disqualified.
5. Failed to submission of work by given date shall be disqualified.
6. The time for submission is 11.59.59 PM of the given date.
7. Please write your name and tutorial name during submission (for eg: Rajan_Tutorial_1).You should strictly follow the naming standard.
8. Code shall be submitted as run on IDE and Screenshot shall be submitted.
9. Report format shall be strictly followed to submit the document. Just photos will not be accepted for algorithm and code.
10. NQ will be granted if no assignment are taken into consideration.
11. I was absent in the class won't be the excuses for assignment.

Please submit the assignment to: assignment.bca81@gmail.com

No other medium shall be accepted.

Best of Luck