Department of Mathematics and Computing, IIT(ISM) Dhanbad

B. Tech., Semester-II, Subject: Numerical Methods

Tutorial Sheet - 2

Method-1. Newton-Gregory forward

1. Find the value of $\sin(46.7361^\circ)$ using the given data.

θ	45°	50°	55°	60°
$\sin\theta$	0.7071	0.7660	0.8192	0.8660

Answer: 0.7282

2. In the table below the values of y are consecutive terms of a series of which the number 21.6 is the 6th term. Find the 2^{nd} term of the series.

x	3	4	5	6	7	8	9
y	2.7	6.4	12.5	21.6	34.3	51.2	72.9

Answer: 0.1

3. If $f(x)$ is known at the following data points.

x	0	1	2	3	4
$f(x)$	1	7	23	55	109

then find $f(0.5)$ using Newton's forward difference formula.
Answer: 3.125

Method-2. Newton-Gregory backward

1. Given the following data estimate $f(4.12)$ using Newton-Gregory backward difference interpolation polynomial:

x	0	1	2	3	4	5
$f(x)$	1	2	4	8	16	32

Answer: 17.39135

2. Estimate $f(7.5)$ using Newton-Gregory Backward difference interpolation formula. Given

Answer: 421.875

x	1	2	3	4	5	6	7	8
y	1	8	27	64	125	216	343	512

3. Estimate the population in year 1925. Given

$Year(x)$	1891	1901	1911	1921	1931
$Population(y), in\ thousand$	46	66	81	93	101

Answer: 96.8368

Method-3. Lagrange's Interpolation

1. Given the following data estimate $f(4.62)$ using Lagrange's Interpolation formula:

x	2	3	5	8	12
$f(x)$	10	15	25	40	60

Answer: 23.10

2. Using Lagrange's interpolation formula, fit a polynomial to following data

x	-1	0	2	3
y	-8	3	1	12

find y at x = 1.5.
Answer: 0.75

3. Find the cubic polynomial in x for the given data below:

x	0	1	2	3	4	5
$f(x)$	-3	3	11	27	57	107

Answer: $x^3 - 2x^2 + 7x - 3$

4. The following data given, find the number of students whose weight is between 60 and 70.

Wt Kg. x	0-40	40-60	60-80	80-100	100-120
No of Students	250	120	100	70	50

Answer: $y(70) - y(60) = 54$