

# Assignment#3

## Interpolation

1. The following values of the function  $f(x) = \sin(x) + \cos(x)$ , are given:

x	10	20	30
f(x)	1.1585	1.2817	1.336

Construct the quadratic interpolating polynomial that fits the data using Lagrange Interpolation and find  $f(\frac{\pi}{12})$ .

2. Develop pseudo-code to interpolate the given set of data using Lagrange Interpolation.  
3. Find the interpolating polynomial from the data given below using Newton's Divided Difference Interpolation formula:

x	0.5	1.5	3	5	6.5	8
f(x)	1.625	5.875	31.0	131.0	282.125	521.0

Also find the value of  $f(7)$ .

4. For the following data, obtain the Newton-Gregory Forward Difference Polynomial. And interpolate at  $x = 0.15$ .

x	0.1	0.2	0.3	0.4	0.5
f(x)	1.4	1.56	1.76	2	2.28

5. Use Newton-Gregory Backward Interpolation to estimate the value of  $f(x)$  at  $x=1$  using following data:

x	0.1	0.3	0.5	0.7	0.9	1.1
f(x)	-1.699	-1.073	-0.375	0.443	1.429	2.631

6. Using appropriate Newton's Interpolation Technique, estimate  $y(15)$  and  $y(85)$  from the following data:

x	10	30	50	70	90
y	34	56	45	23	36

7. The following data are taken from the steam table

Temp. °C	140	150	160	170	180
Pressure kgf/cm <sup>2</sup>	3.685	4.854	6.302	8.076	10.225

Find the pressure at the temperature  $T = 142^\circ\text{C}$  &  $T = 175^\circ\text{C}$  using Newton's Interpolation.

8. Find the value of  $\log 337.5$  from the following table by using Gauss Forward Interpolation formula:

x	310	320	330	340	350	360
log x	2.49136	2.50515	2.5185	2.53148	2.54407	2.5563

9. Find the value of  $\sin 45^\circ$  from the following table by using Gauss Backward Interpolation formula:

x = $\theta$	20	30	40	50	60	70	80
y = $\sin \theta$	0.342	0.502	0.6427	0.7604	0.8660	0.93919	0.98481

10. Using Stirling's formula find  $U_{28}$ , given:

$$U_{20} = 49225, U_{25} = 48316, U_{30} = 47236, U_{35} = 45926, U_{40} = 44306$$

11. Apply Bessel's formula to find the value of  $f(27.5)$  from the table:

x	25	26	27	28	29	30
f(x)	4.00	3.846	3.704	3.571	3.448	3.333

12. What is Cubic Spline Interpolation? What is advantage of this method over polynomial interpolation

13. Estimate  $y(6.5)$  using Natural Cubic Spline Interpolation technique from the following data:

x	3	5	7	9	11
y	8	10	9	12	5

14. Find  $y$  at  $x = 8$  from the following data using Natural Cubic Spline Interpolation:

x	3	5	7	9
y	3	2	3	1