Assignment#3

Curve Fitting: 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. Use Lagrange's Interpolation formula, evaluate f(3) from the table:

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

3. Develop pseudo-code to interpolate the given set of data using Lagrange Interpolation.
4. 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).

5. 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

6. 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

7. 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

8. The following data are taken from the steam table

Temp. ºC	140	150	160	170	180
Pressure kgf/cm^2	3.685	4.854	6.302	8.076	10.225

   Find the pressure at the temperature T = 142ºC & T = 175ºC using Newton's Interpolation.

9. 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

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

x = ɵ	20	30	40	50	60	70	80
y = Sin ɵ	0.342	0.502	0.6427	0.7604	0.8660	0.93919	0.98481

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

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

12. 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

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

14. 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

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

x	3	5	7	9
y	3	2	3	1