

Lab 4 Output

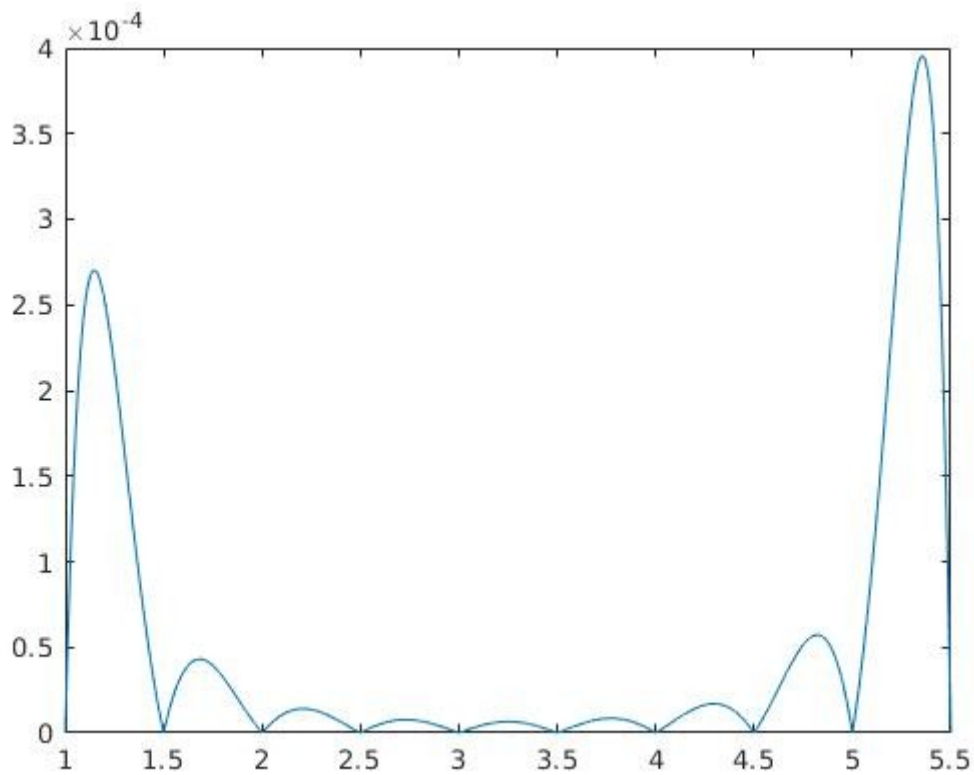
Q1.

Forward Diff Interpolation

value at: $2.250000e+00 = 9.487749e+00$

error: $1.362249e-05$

Plot of Error(x)

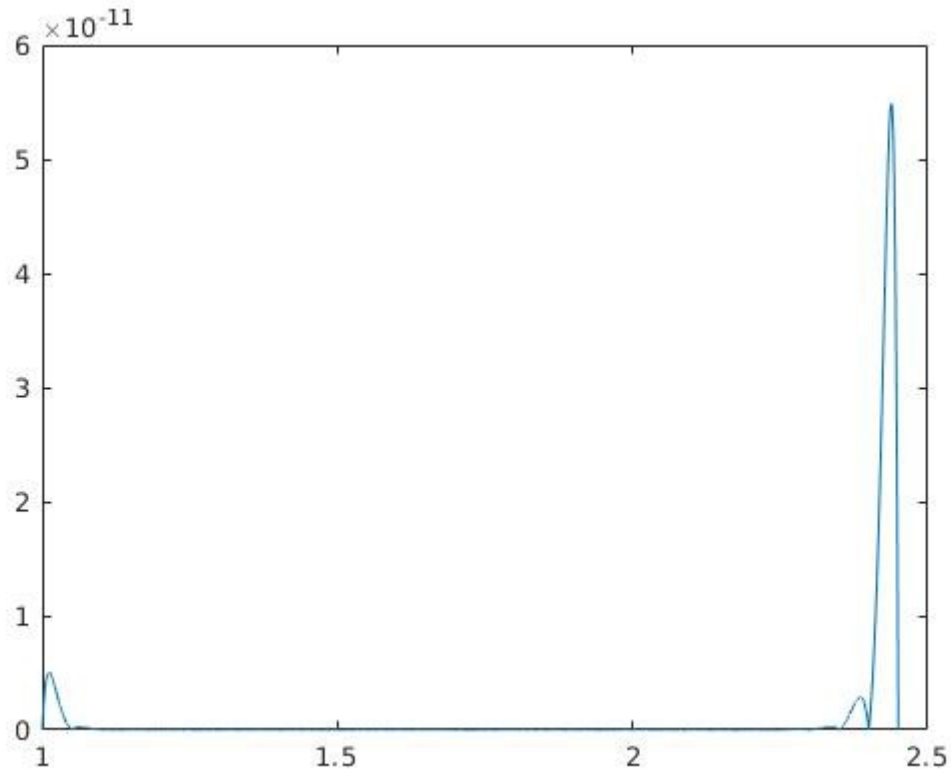


Backward Diff Interpolation

value at: $2.250000e+00 = 9.487736e+00$

error: $8.881784e-15$

Plot of Error(x)



Q2.

Newton Polynomial: $(18142471784598271z)/45035996273704960 + \pi/4 -$
 $(142621718215989*((11z)/5 - 11/5)*((11z)/5 - 16/5))/4503599627370496 +$
 $(232704172521869*((11z)/5 - 11/5)*((11z)/5 - 16/5)*((11z)/5 - 21/5))/54043195528445952 -$
 $(6386596488539*((11z)/5 - 11/5)*((11z)/5 - 16/5)*((11z)/5 - 21/5)*((11z)/5 -$
 $26/5))/13510798882111488 + (9073440034991*((11z)/5 - 11/5)*((11z)/5 - 16/5)*((11z)/5 -$
 $21/5)*((11z)/5 - 26/5)*((11z)/5 - 31/5))/216172782113783808 - (2352748604891*((11z)/5 -$
 $11/5)*((11z)/5 - 16/5)*((11z)/5 - 21/5)*((11z)/5 - 26/5)*((11z)/5 - 31/5)*((11z)/5 -$
 $36/5))/810647932926689280 + (5950137968629*((11z)/5 - 11/5)*((11z)/5 - 16/5)*((11z)/5 -$
 $21/5)*((11z)/5 - 26/5)*((11z)/5 - 31/5)*((11z)/5 - 36/5)*((11z)/5 -$
 $41/5))/45396284243894599680 + (166750522271*((11z)/5 - 11/5)*((11z)/5 - 16/5)*((11z)/5 -$
 $21/5)*((11z)/5 - 26/5)*((11z)/5 - 31/5)*((11z)/5 - 36/5)*((11z)/5 - 41/5)*((11z)/5 -$
 $46/5))/181585136975578398720 - (3302669325073*((11z)/5 - 11/5)*((11z)/5 - 16/5)*((11z)/5 -$
 $21/5)*((11z)/5 - 26/5)*((11z)/5 - 31/5)*((11z)/5 - 36/5)*((11z)/5 - 41/5)*((11z)/5 -$
 $46/5)*((11z)/5 - 51/5))/3268532465560411176960 + (81450844697*((11z)/5 - 11/5)*((11z)/5 -$
 $16/5)*((11z)/5 - 21/5)*((11z)/5 - 26/5)*((11z)/5 - 31/5)*((11z)/5 - 36/5)*((11z)/5 -$
 $41/5)*((11z)/5 - 46/5)*((11z)/5 - 51/5)*((11z)/5 - 56/5))/583666511707216281600 -$
 $18142471784598271/45035996273704960$

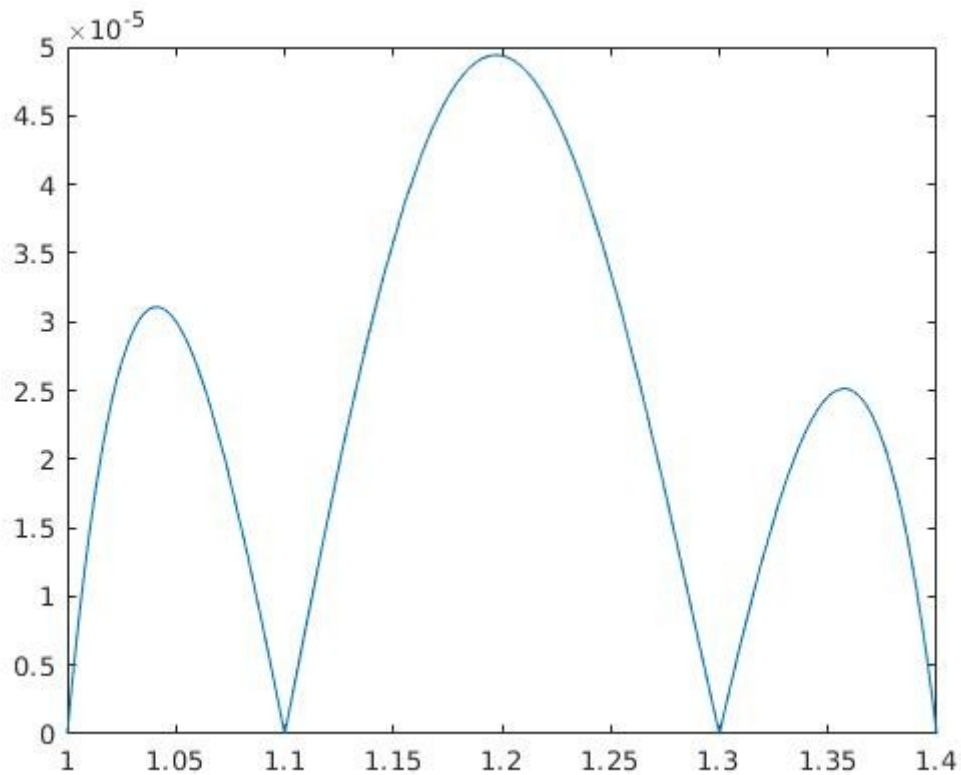
Error for 30 points

n	x(i)	Error(x(i))
1	1.000000	0.000000e+00
2	1.212121	2.552665e-05
3	1.424242	1.776629e-06
4	1.636364	3.231857e-06
5	1.848485	6.348679e-07
6	2.060606	7.025829e-07
7	2.272727	2.766399e-07
8	2.484848	2.243325e-07
9	2.696970	1.580059e-07
10	2.909091	9.620487e-08
11	3.121212	1.188799e-07
12	3.333333	5.092262e-08
13	3.545455	1.180223e-07
14	3.757576	2.780816e-08
15	3.969697	1.561704e-07
16	4.181818	2.220446e-16
17	4.393939	2.824137e-07
18	4.606061	9.209033e-08
19	4.818182	7.353039e-07
20	5.030303	6.247156e-07
21	5.242424	3.090167e-06
22	5.454545	5.982758e-06
23	5.666667	2.950969e-05
24	5.878788	2.348461e-04
25	6.090909	9.562987e-04
26	6.303030	2.972349e-03
27	6.515152	7.857319e-03
28	6.727273	1.855722e-02
29	6.939394	4.026310e-02
30	7.151515	8.168972e-02

31	7.363636	1.568935e-01
32	7.575758	2.877939e-01
33	7.787879	5.075955e-01

Q3.

As we can see in the plot of Error(x) in the interval [1,1.4] max error at $x = 1.2$ is 5×10^{-5}



Q4

Value of $f(0.2)$ using Divided Diff Interpolation:-5.778590e+00

Value of $f(0.2)$ using Lagrange Interpolation:-5.778590e+00

New Value of $f(0.2)$ using Divided Diff Interpolation:-5.778599e+00

New Value of $f(0.2)$ using Lagrange Interpolation:-5.778599e+00

Q5.

(a) $f(0.18) = -5.081431e-01$

(b) $f(0.25) = 1.188935e+00$

Q6

Population in 1940 = 102397

Population in 1975 = 2.150428e+05

Population in 2020 = 513443

Q7

Interpolating using second degree polynomial $f(4) = 1.5727e+00$

Interpolating using third degree polynomial $f(4) = 1.5727e+00$