DEPARTMENT OF MATHEMATICS, I.I.T. GUWAHATI

MA 322: Scientific Computing Lab - V

1. Approximate $f(0.05)$ using the following data and the Newton forward-difference formula:

x	0.0	0.2	0.4	0.6	0.8
$f(x)$	1.00000	1.22140	1.49182	1.82212	2.22554

   Use the Newton backward-difference formula to approximate $f(0.65)$.

2. Construct the Lagrange interpolating polynomial for the function $f(x) = \sin(\ln x)$, and find a bound for the absolute error on the interval $[x_0, x_2]$, where $x_0 = 2.0$, $x_1 = 2.4$, $x_2 = 2.6$.

3. Use appropriate Lagrange interpolating polynomials to approximate each of the following:

   a. $f(0.43)$ if $f(0) = 1$, $f(0.25) = 1.64872$, $f(0.5) = 2.71828$, $f(0.75) = 4.48169$

   b. $f(0.9)$ if $f(0.6) = -0.17694460$, $f(0.7) = 0.01375227$, $f(0.8) = 0.22363362$, $f(1.0) = 0.65809197$

4. A census of the population of the United States is taken every 10 years. The following table lists the population, in thousands of people, from 1950 to 2000:

Year	1950	1960	1970	1980	1990	2000
Populations (in thousands)	151,326	179,323	203,302	226,542	249,633	281,422

   Use appropriate divided differences to approximate the population in the years 1940, 1975, 2020.

5. Write programmes for constructing Lagrange and Newton's divided difference interpolating polynomials for approximating a function at a given set of data points. Using them, find $f(0.2)$ from the following table:

x	0.0	0.1	0.3	0.6	1.0
$f(x)$	-6.00000	-5.89483	-5.65014	-5.17788	-4.28172

   Are you getting the same result from both the polynomials? If so, why?
   Add $f(1.1) = -3.99583$ and see how it effects your solution.