INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
DEPARTMENT OF MATHEMATICS

MA 322: SCIENTIFIC COMPUTING
Semester–II, Academic Year 2022-23
Lab − 3

L3_1. Solve the following system of nonlinear equations using the Newton's method.

$$3x^2 + 4y^2 - 1 = 0$$
$$-8x^3 + y^3 - 1 = 0.$$

Hint: The above system has a root near (-0.5, 0.25).

L3_2. Solve the following system of nonlinear equations using the Newton's method.

$$4x^2 + y^2 - 4 = 0$$
$$x + y - \sin(x - y) = 0.$$

Hint: The above system has a root near (1.0, 0.0).

L3_3. Consider the following data: Calculate and print the divided-difference table.

x	-10	-7	-1	3	5	5.5	7.25
$f(x)$	-4	10	2.1	-1.7	10	-2.25	1.125

L3_4. For a function $f(x)$, we define the forward difference as

$$\Delta f = f(x + h) - f(x)$$

and the backward difference as

$$\nabla f = f(x) - f(x - h)$$

for some $h > 0$. Calculate the forward and backward differences for $f(x)$ given below:

x	-10	-7	-1	2	5	8	11
$f(x)$	-2	-10	20	-17	11	-2.25	0.125