DEPARTMENT OF MATHEMATICS
IIT GUWAHATI

MA 332 Scientific Computing Lab - II

1. Use the fixed-point iteration method to determine a solution accurate to within 10^{-2} for $x^3 - x - 1 = 0$ on $[1, 2]$. Use $x_0 = 1$.

2. For each of the following equations, determine an interval $[a, b]$ on which fixed-point iteration will converge. (i) Estimate the number of iterations necessary to obtain approximations accurate to within 10^{-5}, and (ii) Perform the calculations.

   (a) $3x^2 - e^x = 0$

   (b) $x - \cos x = 0$

3. Use the fixed-point iteration method to evaluate a root of the equation $x^2 - x - 1 = 0$ using the following forms of $\phi(x)$:

   (a) $x = x^2 - 1$

   (b) $x = 1 + 2x - x^2$

   (c) $x = \frac{1}{2}(1 + 3x - x^2)$

   starting with (i) $x_0 = 1$ and (ii) $x_0 = 2$. Discuss the results.

4. Find the square root of 0.75 by writing $f(x) = x^2 - 0.75$ and solving the equation

   $$x = x^2 + x - 0.75$$

   by the method of fixed-point iteration. Assume an initial value of $x_0 = -0.8$. Try with an initial value of $x_0 = 0.8$. Comment on the results.

5. Use Muller's method to find a root of the following equations(initial three points has given):

   (a) $x^3 - x - 2 = 0$, $x_1 = 1$, $x_2 = 1.2$, $x_3 = 1.4$

   (b) $1 + 2x - \tan x = 0$, $x_1 = 1.5$, $x_2 = 1.4$, $x_3 = 1.3$

6. Use Muller's method to find roots of the following equations:

   (a) $x^2 + e^x = 5$, root near $x = 1$ and $x = -2$

   (b) $x^2 = \sin x$, root near $x = 0.9$

7. Find a complex root of each of the following: (i) $z^4 - 2z^3 - 2iz^2 + 4iz = 0$, (ii) $z = e^z$.