**Root finding technique from Bisection Method**

The bisection method is one of the simplest and most reliable of iterative methods for the solution of non-linear equations.This method is also known as half-interval method, relies on the fact that if f(x) is real and continuous in the interval x0 <= x <= x1 and f(x0) & f(x1) are of opposite sign i.e. f(x0) = -ve & f(x1) = +ve

f(x0) \* f(x1) < 0 root E [x0 , x1]

Then there is at least one real root in the interval between x0 & x1 (may be more than one root)

Let us also define another point m to be the midpoint between x0 and x1 i.e.

m = (x0 + x1) / 2

Now there exist the following three conditions:-

1. if f(m) = 0 , we have root at m
2. if f(m) \* f(x0) < 0, There is a root between m and x0.
3. If f(x0) \* f(x1) < 0, There is a root between m and x1.

It follows that by testing the sign of the function at midpoint.

Since f(x0) and f(x1) are of opposite sign, a root lies between x0 and x1. We can further divided this sub interval into two interval to locate a new sub interval containing the root.

This process can be repeated untill the interval containing the root is as small as we desire.

**s = starting search interval**

**new interval – s/2**

**f(x)**

**x0 m x1**

**Fig 1.1 Root approximation by bisection method**