**Root Finding by Bisection Method**

**Bisection Method:**

* An implementation of the bisection method in Matlab is given in the textbook (page 75) and is made available to you with minor modification as Matlab function **bisect1** saved as file **bisect1.m.** You can download this file from course website (Or just copy-paste from the code bellow).
* The following script calls the function **bisect1** for the example 3.1.1 of the textbook (page73), with f(x) = x6- x-1 and values of interval as [a , b] = [1 ,2] and the tolerance of 0.001.

**clear all;**

**close all;**

**a0 = 1;**

**b0 = 2;**

**ep = 0.001;**

**root=bisect1(a0,b0,ep)**

* Type/Download this script in Matlab and save it as a file.
* Run this script and compare your results with Table 3.1 (page 73) of the textbook.
* Verify your results until n = 5 by doing the calculations using your calculator as done in class
* Change the error tolerance (ep) to 0.00001, does your answer change, does number of iteration changes?
* From Matlab help command find the use of “eps” function. Change the error tolerance to machine precision (ep = eps) does your answer change?
* Change the error tolerance to 1e-18, does your answer change, if no, why?
* Carefully study the Matlab code bisect1.m and make sure you understand the algorithm and Matlab commands.
* Implement the steps in home work (HW). You are not supposed to turn in this HW assignment. However, there will be Lab Quiz next week based on this HW assignment.



% Lab 06: Root Finding by Bisection Method

% Save this code as “bisect1.m”

function root=bisect1(a0,b0,ep)

%

% function bisect1(a0,b0,ep)

%

% This is the bisection method for solving an equation f(x)=0.

%

% The function f is defined below by the user. The function f is

% to be continuous on the interval [a0,b0], and it is to be of

% opposite signs at a0 and b0. The quantity ep is the error

% tolerance.

% For the given function f(x), an example of a calling sequence

% might be the following:

% root = bisect1(1,2,0.001)

%

%

% The following will print out for each iteration the values of

% count, a, b, c, b-c, f(c)

format short

a = a0; b = b0;

fa = f(a);

fb = f(b);

c = (a+b)/2;

it\_count = 0;

while b-c > ep

 it\_count = it\_count + 1;

 fc = f(c);

% Internal print of bisection method. Tap the carriage

% return key to continue the computation.

 iteration = [it\_count a b c b-c fc]

 if sign(fb)\*sign(fc) <= 0

 a = c;

 fa = fc;

 else

 b = c;

 fb = fc;

 end

 c = (a+b)/2;

 pause

end

root = c

error\_bound = b-c

it\_count

%%%%%%%%%%%%%%%%%%%%%%%%%%%%

function value = f(x)

 % value = tan(x) - x;

 value=exp(-x)-sin(x);

end

end

 **Homework Lab #07**

**Question #1**

* For the exercise done in the lab, plot the function f(x) = x6- x-1 over the interval [a , b] = [1 ,2] in Matlab, verify there is a change of sign at the endpoints for this function, what does this tell you?
* Change the interval [a b] to [-1 2] and again plot the function, what do you observe?

**Question #2**

Modify the Matlab code to find the root of the functions given in the problem 1 (page 77) of your textbook. Note in each case you must first plot the function to find the interval [a b] which contains only one root