Contents


```
% Ali Heydari
% Math 231, hw3
% Bisection Method
```

Interactive Interface (with user input)

% get input a = input('Please enter a value for the lower bound a: '); b = input('Please enter a value for the upper bound (b) : '); delta = input('Please enter the desired tolerance: '); f = input('Please enter f(x)?(type @(x) [then the function] ');

```
% see if any of the boundaries are a root
```

Non Interactive (without user input)

```
f = @(x) x^3 - 3*x + 2;


retur = 0;
counter = 0;
x_k = ones(1,10);
error = zeros(1,10);
e_n = zeros(1,10);

delta = 10^-6
a = -4;
b = 0;
```

Method

```
fa = f(a);

if fa == 0

    root = a;
    retur = 1;

end;
```

```
fb = f(b);

if fb == 0
    root = b;
    retur = 1;

end;

% if the boundaries are not the root then do bisection

if retur ~= 1

    % check if the user hasnt lost their mind
    if sign(fa) == sign(fb)

        display('Error: f(a) and f(b) have same sign.')

        retur = 1;

    end;

    % if all is gucci


            while abs(b-a) > delta && retur ~= 1
                % As Mayya said in class, keep going until Iterate I <= 2delta

                counter = counter + 1;

                c = (a+b)/2;
                fc = f(c);

                if fc == 0
                        root = c;
                        retur = 1;
                end;

                % cehk to see which side of the interval we want

                if sign(fc) == sign(fa)
                        a = c;
                        fa = fc;
                else
                        b = c;
                        fb = fc;
```

```
                end;

            end;

            % hopefully we got want we need
            root = (a+b)/2;
end

fprintf('The found root is: %i \n',root);
fprintf('Total iterations: %i \n', counter);
```

Output Formatting

```
disp(" ");
disp(" ");
fprintf('The root of the function is at x = %i \n', root);
fprintf('Number of iterations: %i \n', counter);
disp(" ");
disp(" ");

disp("        pn              |p_{n+1} - p_n|       e_n = |pn - p| ")
for i= 1 : counter

fprintf("%i   %i         %i         %i\n",i ,x_k(i),error(i),e_n(i));

end
```

Outputs

```
delta =

   1.0000e-06

The found root is: -2
Total iterations: 9


The root of the function is at x = -2
Number of iterations: 9


        pn              |p_{n+1} - p_n|       e_n = |pn - p|
       -2.1                0.15                0.1
       -1.95               0.075               0.05
       -2.025              0.0375              0.025
       -1.9875             0.01875             0.0125
```

```
-2.0063          0.009375        0.0062499
-1.9969          0.0046875       0.0031251
-2.0016          0.0023438       0.0015624
-1.9992          0.0011719       0.00078135
-2.0004          0.00058594      0.00039053
```