DELHI TECHNOLOGICAL UNIVERSITY

SCIENTIFIC COMPUTING
(MC-204)
PRACTICAL FILE

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EXPERIMENT 1

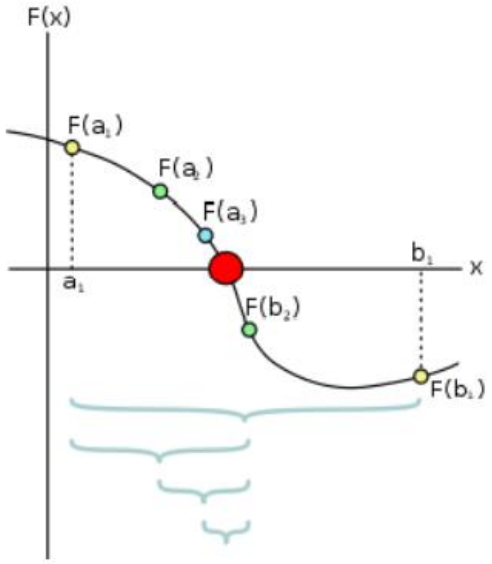
AIM

Write the MATLAB program for Bisection method and Newton Raphson method for finding the roots of given function at given interval.

THEORY

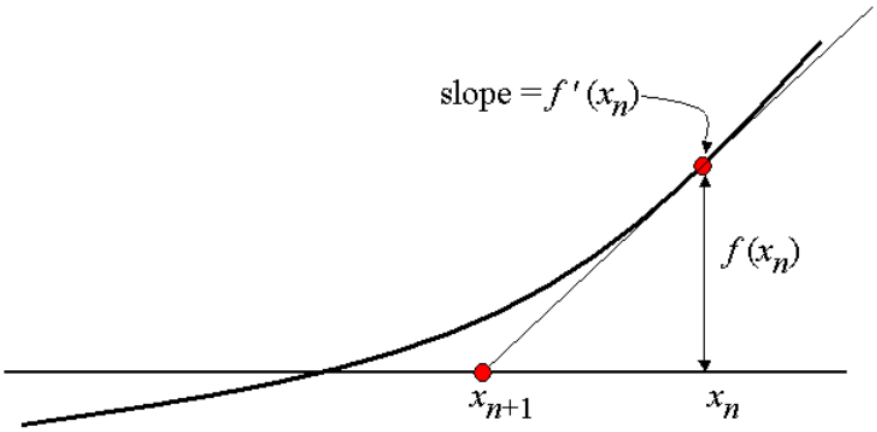
BISECTION METHOD

The bisection method is a root-finding method that applies to any continuous functions for which one knows two values with opposite signs. The method consists of repeatedly bisecting the interval defined by these values and then selecting the subinterval in which the function changes sign, and therefore must contain a root. It is a very simple and robust method, but it is also relatively slow. Because of this, it is often used to obtain a rough approximation to a solution which is then used as a starting point for more rapidly converging methods.



NEWTON RAPHSON METHOD

We draw a tangent line to the graph of f(x) at the point x=xn. This line has slope f′ (xn) and goes through the point (xn, f (xn)). Therefore it has the equation y=f′ (xn) (x–xn) +f (xn). Now, we find the root of this tangent line by setting y=0 and x=xn+1for our new approximation. Solving this equation gives us our new approximation, which is xn+1=xn–f′ (xn)/f (xn).



SOURCE CODE

1. Bisection Method

```
%bisection method
%the function
syms x
f(x) = x^2 - 6*x + 7;
disp("The function: ")
disp(f(x))


%limits (f(2) = -1,f(0) = 7)
a=0;
b=2;
error = 0.00001;
```

```
c=(a+b)/2;


while(abs(f(c))>error)
    if(f(c)*f(a)<0)
        b=c;
    else
        a=c;
    end
    c=(a+b)/2;
end


fprintf("The root of the given function: %f", c)
```

2. Newton – Raphson Method

```
%newton raphson method
clear all;
close all;

%the function
syms x;
f(x)= x*(exp(x)) - cos(x);
disp("The function: ")
disp(f(x))


%starting point : f(0)=-1, f(1)=e
x0=0;


df(x)=diff(f(x));


%applying the recurrence relation
while(df(x0)>0.01)
 x1=x0-(f(x0)/df(x0));
 fprintf('The root %f \n',x1);
 fprintf('Value of function %f\n\n', f(x1));
 x0=x1;
end
disp('Roots repeat after this.')
```

OUTPUT

1. Bisection Method

```
>> bisectionmethod
The function:
x^2 - 6*x + 7

The root of the given function: 1.585785
>>
```

2. Newton – Raphson Method

```
>> newton_raphson
The function:
x*exp(x) - cos(x)

The root 1.000000
Value of function 2.177980

The root 0.653079
Value of function 0.460642

The root 0.531343
Value of function 0.041803

The root 0.517910
Value of function 0.000464

The root
0.517757
Value of function
0.000000
```