Indian Institute of Information Technology Vadodara

MA202: Numerical Techniques Lab
Semester: IV
Lab 7

Name : **Abhiyank Raj Tiwari**

Student Id : **201951011**

Section : **2A**

Course Instructor : **Dr Vivek Vyas**

Note: I have made PDF from next page using matlab only. They are in parts. I have merged them all.

Q. 1: Consider the nonlinear equations

a.) $f(x) = 2.0 - x + ln(x) = 0$
b.) $f(x) = x^2 - 3x + 1 = 0$

Write a MATLAB function to solve the non-linear equations using Bisection method, Fixed point iteration method, Newton-Raphson method. Use fzero() and fsolve() MATLAB functions to verify your answers.

Table of Contents

Question: 1.1

```
%%f(x) = 2.0-x+ln(x) = 0
```

Fucntion Calling

```
bisecting()
fpt()
newton()
```

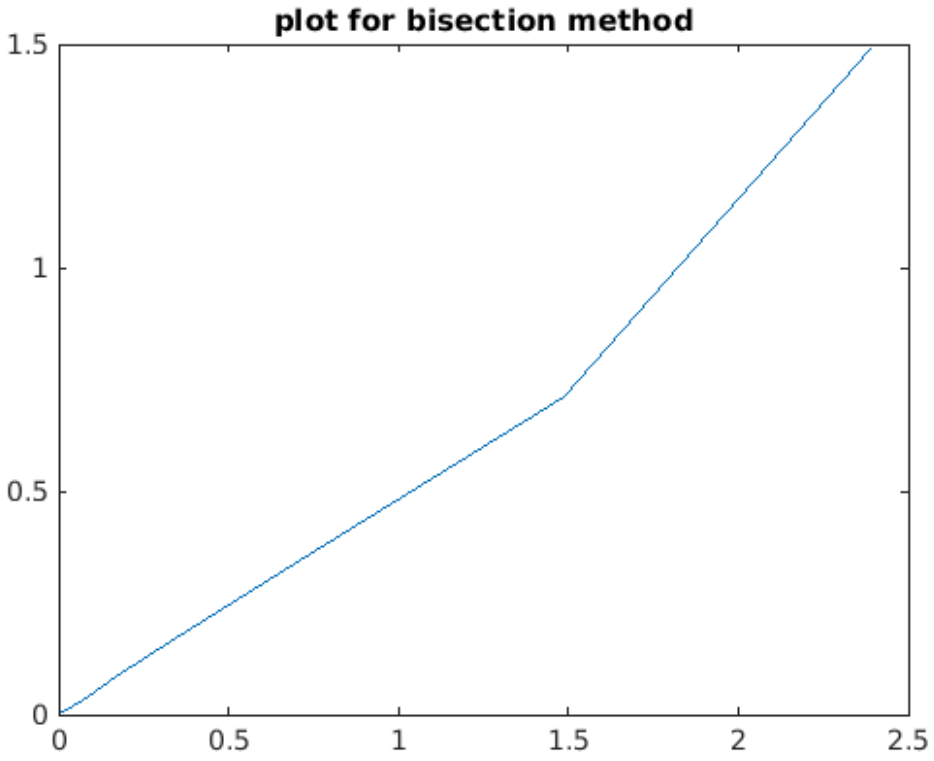
Bisection Method

```
function bisecting()
x1=1.0;
x2=5.0;
f1=finder (1,x1);
f2=finder (1, x2);
maxitr=50;
tol=10^-6;
if(f1*f2>0)
    fprintf("Invalid guess !!");
end
err=zeros(1, maxitr);
for itr= 1:1:maxitr
    m=(x1+x2)/2;
    fm=finder(1,m);
    err(itr)=abs(f2-f1);
    if(err(itr)<tol)
        break
    end
    if(f1*fm>0)
        x1=m;
        f1=fm;
    else
        x2=m;
        f2=fm;
    end
end
m
figure(1)
plot(err(1:itr-1),err(2:itr))
```

```
title('plot for bisection method')
end
```

```
m =

    3.1462
```



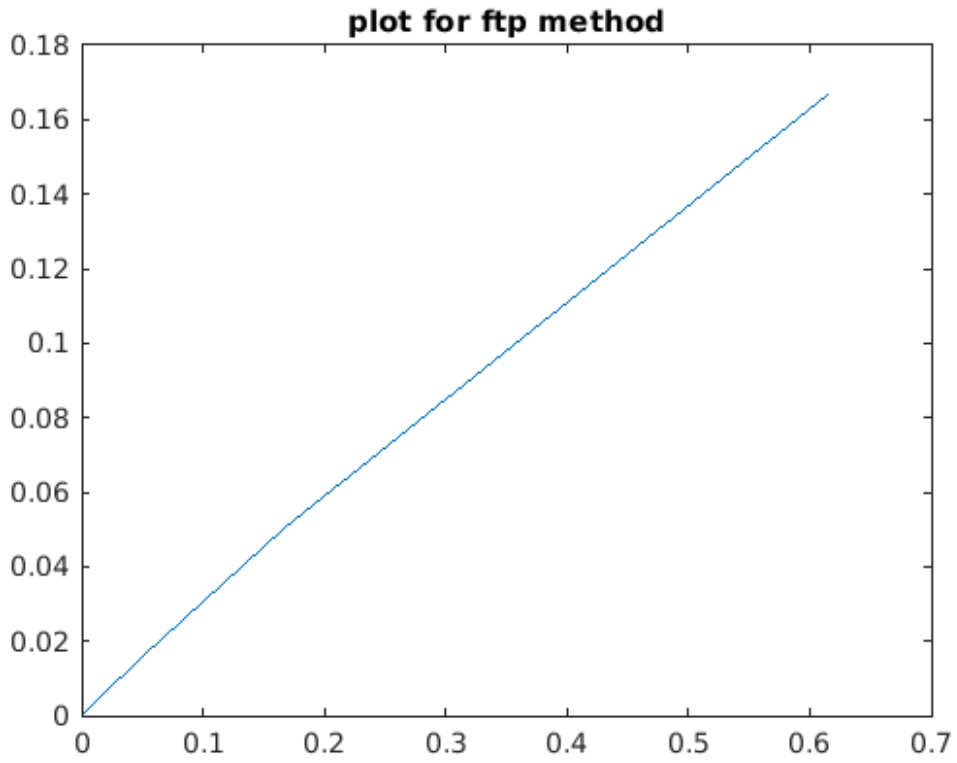
Fixed Point Iterator

```
function fpt()
x=4;
xold=4;
maxitr=50;
errfp=zeros(1, maxitr);
tol=10^-6;
for itr=1:1: maxitr
    x=finder(2, xold);
    errfp(itr)=abs(x-xold);
    xold=x;
    if errfp(itr)<tol
        break
    end
end
x
```

```
figure(2)
plot(errfp(1:itr-1), errfp(2:itr))
title('plot for ftp method')
end
```

```
x =

    3.1462
```



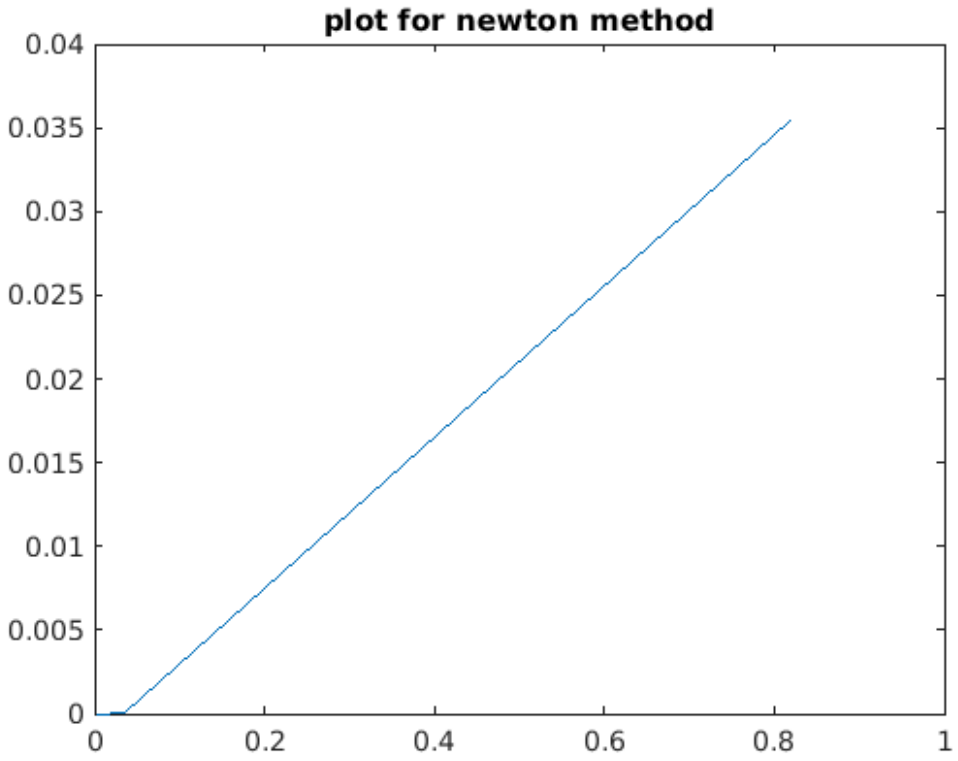
Newton Method

```
function newton()
    x=4;
    maxitr=50;
    errnt=zeros(1, maxitr);
    tol=10^-6;
    for itr=1:1: maxitr
        fx=finder (1,x);
        dfx=finder(3,x);
        xnew=x-fx/dfx;
        errnt(itr)=abs(xnew-x);
        if(errnt(itr)<tol)
            break
        end
```

```
        x=xnew;
    end
xnew
figure(3)
plot(errnt(1:itr-1),errnt(2:itr))
title('plot for newton method')
end
function fval=finder (arg,xval)
    if arg==1
        fval=2-xval+log(xval);
    elseif arg==2
        fval=2+log(xval);
    else
        fval=1/(xval)-1;
    end
end
```

```
xnew =

    3.1462
```



Published with MATLAB® R2020b

Table of Contents

Question: 1.1

```
%%f(x) = x^2 -3x +1 = 0
```

Fucntion Calling

```
bisecting()
fpt()
newton()
```

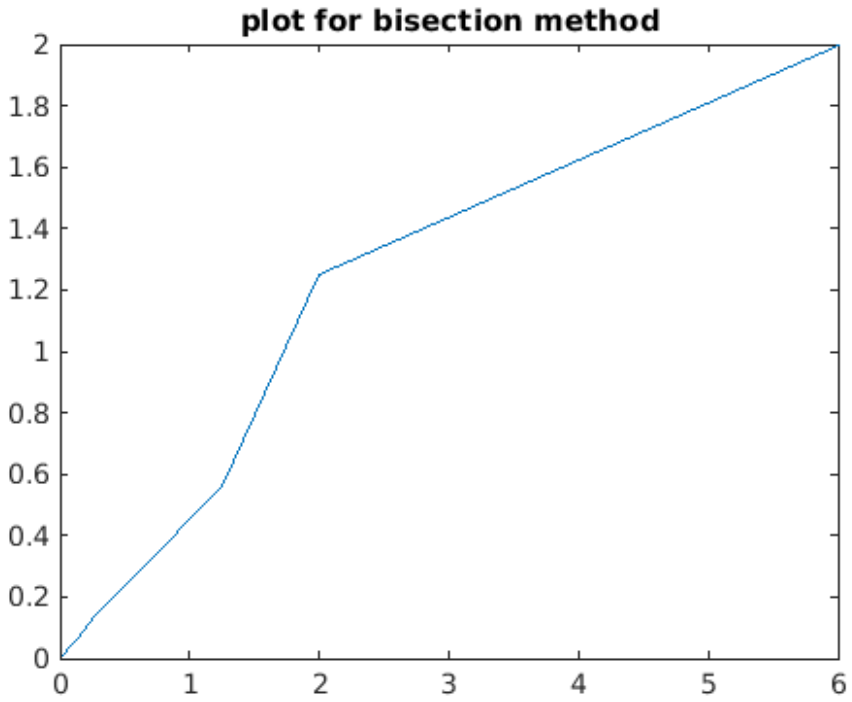
Bisection Method

```
function bisecting()
x1=2.0;
x2=4.0;
f1=finder (1,x1);
f2=finder (1,x2);
maxitr=50;
tol=10^-6;
if(f1*f2>0)
    fprintf("Invalid guess !!");
end
err=zeros(1, maxitr);
for itr= 1:1:maxitr
    m=(x1+x2)/2;
    fm=finder(1,m);
    err(itr)=abs(f2-f1);
    if(err(itr)<tol)
        break
    end
    if(f1*fm>0)
        x1=m;
        f1=fm;
    else
        x2=m;
        f2=fm;
    end
end
m
figure(1)
plot(err(1:itr-1),err(2:itr))
```

```
title('plot for bisection method')
end
```

```
m =

    2.6180
```



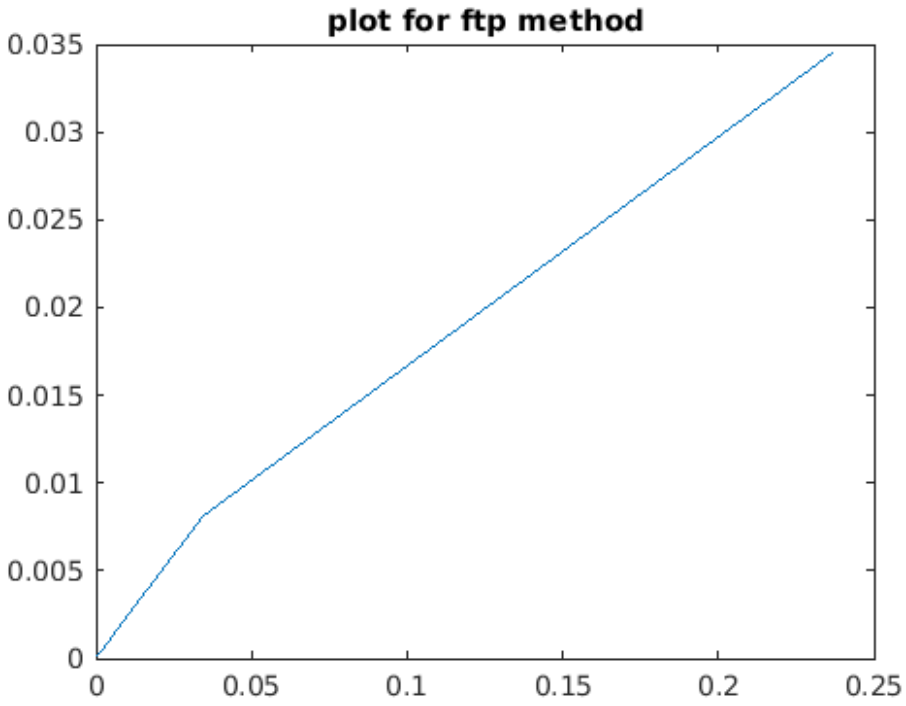
Fixed Point Iterator

```
function fpt()
    x=0.1;
    xold=x;
    maxitr=50;
    errfp=zeros(1, maxitr);
    tol=10^-6;
    for itr=1:1: maxitr
        x=finder(2,xold);
        errfp(itr)=abs(x-xold);
        xold=x;
        if errfp(itr)<tol
            break
        end
    end
    x
    figure(2)
    plot(errfp(1:itr-1), errfp(2:itr))
    title('plot for ftp method')
```

```
end
```

```
x =

    0.3820
```



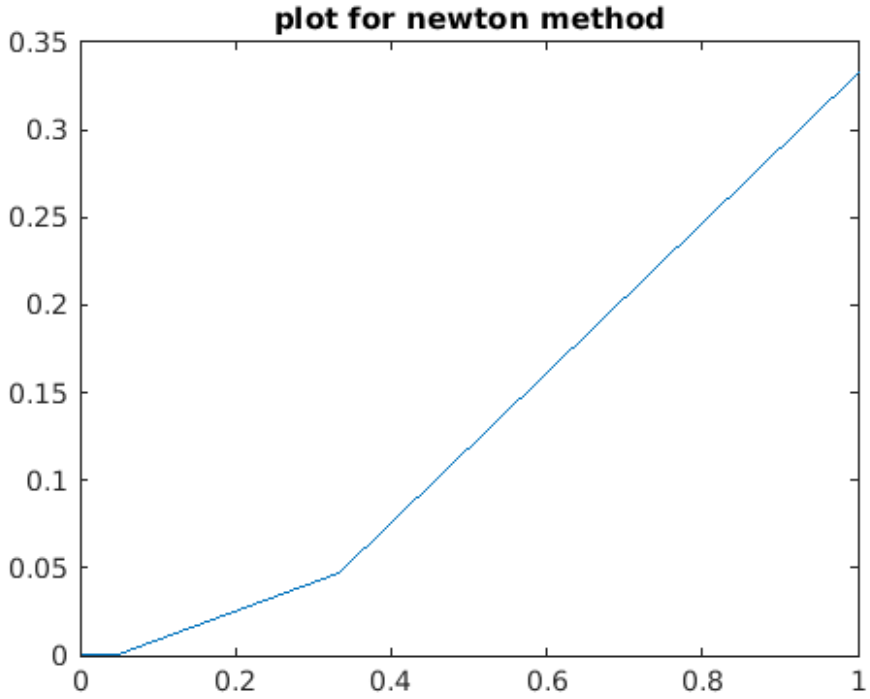
Newton Method

```
function newton()
    x=4;
    maxitr=50;
    errnt=zeros(1, maxitr);
    tol=10^-6;
    for itr=1:1: maxitr
        fx=finder (1,x);
        dfx=finder(3,x);
        xnew=x-fx/dfx;
        errnt(itr)=abs(xnew-x);
        if(errnt(itr)<tol)
            break
        end
        x=xnew;
    end
    xnew
    figure(3)
    plot(errnt(1:itr-1),errnt(2:itr))
    title('plot for newton method')
```

```
end
function fval=finder (arg,xval)
    if arg==1
        fval=xval^2-3*xval+1;
    elseif arg==2
        fval=(xval^2+1)/3;
    else
        fval=2*xval-3;
    end
end
```

```
xnew =

    2.6180
```



Published with MATLAB® R2020b