# ASSIGNMENT-2

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**Q.2(i)- CODE**

## Newton Method

```
clc;
clear all;
f=@(x)x.^2-17;
df=@(x)2*x;
N=100;
acc=0.00001;
x0=4.5;
i=1;
while i<=N
x1=x0 - (f(x0)/df(x0));
if abs(x1-x0) <= acc || abs(((x1-x0))/abs(x1))
<acc
break
end
x0=x1;
i=i+1;
end
fprintf("The method failed after N iterations,
N=%d \n Root: %f",i,x0);
```
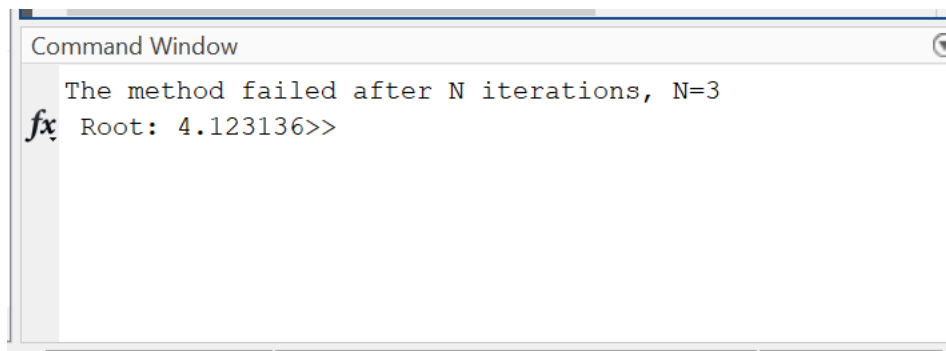
## Secant Method

```
clc;
clear all;
f=@(x)x.^2-17;
df=@(x)2*x;
N=100;
acc=0.00001;
i=1;
x1=4;
x2=5;
```

```
while i<100
x3=x2 - ((x2 -x1)*f(x2))/(f(x2)-f(x1));
if abs(x3-x2)<=acc || abs((x3-x2)/x3) <=acc
    fprintf("Root: %f \n",x3);
break
end
x1=x2;
x2=x3;
i=i+1;
end
fprintf("The method failed after N iterations,
N=%d \n",i);
```
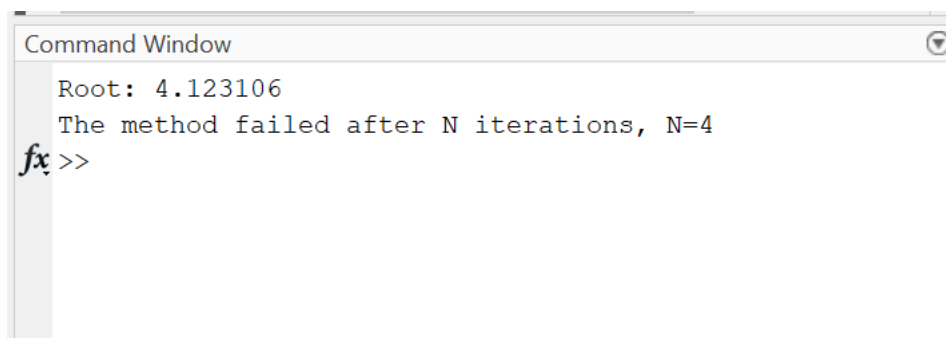
**Output**

Newton Method



```
Command Window                                              ⊙
  The method failed after N iterations, N=3
fx Root: 4.123136>>
```

Secant Method



```
Command Window                                              ⊙
  Root: 4.123106
  The method failed after N iterations, N=4
fx >>
```

**Q.2(ii)- CODE**

**Newton Method**

```
clc;
clear all;
f=@(x)sin(x)-cos(x)+0.5;
df=@(x)cos(x)+sin(x);
```

```
N=100;
acc=0.00001;
x0=0.5;
i=1;
while i<N
    x1=x0-(f(x0)/df(x0));
    if abs(x1-x0)<=acc ||abs((x1-x0))/abs(x1)<acc
        fprintf("Root :%f \n",x1);
        break
    end
    x0=x1;
    i=i+1;
end
fprintf("The method failed after N iterations,
N=%d \n",i);
```

## Secant Method

```
clc;
clear all;
f=@(x)sin(x)-cos(x)+0.5;
df=@(x)cos(x)+sin(x);
N=100;
acc=0.00001;
i=1;
x1=0;
x2=1;
while i<100
x3=x2 - ((x2 -x1)*f(x2))/(f(x2)-f(x1));
if abs(x3-x2)<=acc || abs((x3-x2)/x3) <=acc
    fprintf("Root: %f \n",x3);
break
end
x1=x2;
x2=x3;
i=i+1;
end
fprintf("The method failed after N iterations,
N=%d \n",i);
```

## Output

### Newton Method

```
Command Window                                    ⊙
   Root :0.424031
   The method failed after N iterations, N=3
fx >>
```

### Secant Method

```
Command Window                                    ⊙
   Root: 0.424031
   The method failed after N iterations, N=5
fx >>
```

**Q.2(iii)- CODE**

## Newton Method

```
clc;
clear all;
f=@(x)exp(-1*x)*(x^2 + 5*x +2) + 1;
df=@(x)exp(-1*x)*(2*x + 5) - exp(-1*x)*(x^2 + 5*x
+ 2);
x0=-2.0;
acc=0.00001;
i=1;
N=100;
while i<N
    x1=x0-(f(x0)/df(x0));
    if abs(x1-x0)<=acc ||abs((x1-x0))/abs(x1)<acc
        fprintf("Root :%f \n",x1);
        break
    end
    x0=x1;
    i=i+1;
```

```
end
fprintf("The method failed after N iterations,
N=%d \n",i);
```

## Secant Method

```
clc;

clear all;

%use ivt to find initial guess
f=@(x)exp(-1*x)*(x^2 + 5*x +2) + 1;
df=@(x)exp(-1*x)*(2*x + 5) - exp(-1*x)*(x^2 + 5*x
+ 2);
x1=-2.0;
x2=-1.0;
acc=0.00001;
i=1;
while i<100
x3=x2 - ((x2 -x1)*f(x2))/(f(x2)-f(x1));
if abs(x3-x2)<=acc || abs((x3-x2)/x3) <=acc
    fprintf("Root: %f \n",x3);
break
end
x1=x2;
x2=x3;
i=i+1;
end
fprintf("The method failed after N iterations,
N=%d \n",i);
```

## Output

Newton Method



```
Command Window                                    ⊙
  Root: -0.579159
  The method failed after N iterations, N=6
fx >>
```

## Secant Method

**Q.2(iv)- CODE**

## <u>Newton Method</u>

```
clc;
clear all;
f=@(x)x-2*sin(x);
df=@(x)1-2*cos(x);
N=100;
acc=0.00001;
i=0;
while i<N
    if f(i)*f(i+1)<=acc
        x0=i;
    end
    i=i+1;
end
i=1;
while i<=N
    x1=x0-(f(x0)/df(x0));
    if abs(x1-x0)<=acc ||abs((x1-x0))/abs(x1)<acc
        fprintf("Root :%f \n",x1);
        break
    end
    x0=x1;
    i=i+1;
end
fprintf("The method failed after N iterations,
N=%d \n",i);
```
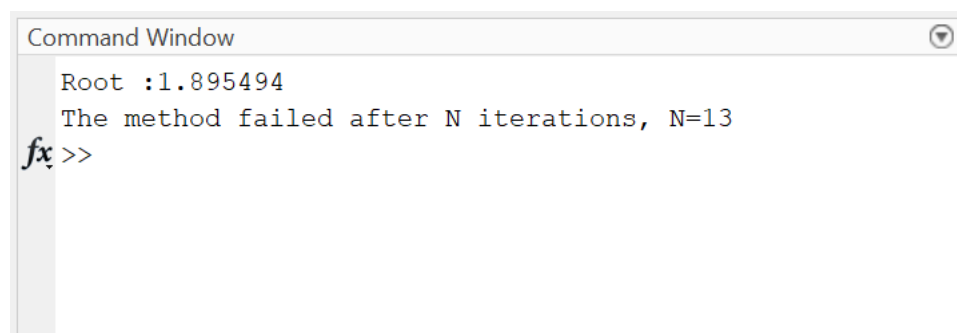
## Secant Method

```
clc;
clear all;
f=@(x)x-2*sin(x);
df=@(x)1-2*cos(x);
N=100;
acc=0.00001;
i=0;
while i<N
    if f(i)*f(i+1)<=acc
        x1=i;
        x2=i+1;
    end
    i=i+1;
end
fprintf("x1= %d, x2= %d \n ",x1,x2);
i=1;
while i<100
x3=x2 - ((x2 -x1)*f(x2))/(f(x2)-f(x1));
if abs(x3-x2)<=acc || abs((x3-x2)/x3) <=acc
    fprintf("Root: %f \n",x3);
break
end
x1=x2;
x2=x3;
i=i+1;
end
fprintf("The method failed after N iterations,
N=%d \n",i);
```

## Output

Newton Method



```
Command Window                                          ⊙
   Root :1.895494
   The method failed after N iterations, N=13
fx >>
```

## Secant Method

**Q.3- CODE**

```
clc;
clear all;
f=@(x)4*(x.^2) -exp(x) -exp(-1*x);
df=@(x)8*x + exp(-x) - exp(x);
acc=1.0000e-05;
N=100;
x=[-10 -5 -3 0 1 3 5 10];
i=1;
l=length(x);
for i=1:l
    x0=x(i);
    itr=1;
    while itr<100
    x1=x0-(f(x0)/df(x0));
    if abs(x1-x0)<=acc ||abs((x1-x0))/abs(x1)<acc

        break
    end
    x0=x1;
    itr=itr+1;
    end
fprintf("For x= %d, Root :%f ,iterations:%d
\n",x(i),x1,itr);
end
```

## Output

```
Command Window                                                          ▼

   acc =

      1.0000e-05

   For x= -10, Root :-4.306245 ,iterations:11
   For x= -5, Root :-4.306245 ,iterations:5
   For x= -3, Root :0.824499 ,iterations:5
   For x= 0, Root :NaN ,iterations:100
   For x= 1, Root :0.824499 ,iterations:4
   For x= 3, Root :-0.824499 ,iterations:5
   For x= 5, Root :4.306245 ,iterations:5
   For x= 10, Root :4.306245 ,iterations:11
fx >>
```