

EXPERIMENT-2

Q1

3. Students are required to write both the program and implement it on the following examples.

Take tolerance value $\epsilon = 0.00001$

- Compute $\sqrt{17}$.
- The root of $\exp(-x)(x^2 + 5x + 2) + 1 = 0$. Take initial guess -1.0 .
- Find a non-zero solution of $x = 2\sin x$. (Apply IVT to find an initial guess)

Ans1(i) by Newton Method

SUCCESSFUL:

The image shows a MATLAB script in the Editor window and the Command Window. The script implements the Newton-Raphson method to find the root of the equation $\exp(-x)(x^2 + 5x + 2) + 1 = 0$. It uses the Interval Halving Theorem (IVT) to find an initial guess and then iteratively refines it using the Newton formula until the tolerance is reached.

```

1 %newton method
2 clc
3 clear
4 f=@(x) x^2-17;
5 fd=@(x) 2*x;
6 tol=0.00001;
7 h=1;
8 flag=0;
9 %ivt
10 for i=-10:h:10
11     if (f(i)*f(i+h)<0)
12         a=i;
13         b=i+h;
14     end
15 end
16
17 N=input('Enter number of iterations \n');
18 x0=(a+b)/2;
19 fprintf('Initial Guess is %f IVT\n',x0);
20 %Newton Formula
21 i=1;
22 while i<=N
23
24     x1= x0 - (f(x0)/fd(x0));
25     if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
26         flag=1;
27         break
28     else
29         x0=x1;
30         i=i+1;
31     end
32 end

```

The Command Window shows the following output:

```

Enter number of iterations
100
Initial Guess is 4.500000 IVT
successfull
The root is 4.123136
Number of iterations is 3
fx >>

```

The Workspace window shows the following variables and their values:

Name	Value
a	4
b	5
f	@(x)x^2-17
fd	@(x)2*x
flag	1
h	1
i	3
N	100
tol	1.0000e-05
x0	4.1231
x1	4.1231

UNSUCCESSFUL:

The screenshot shows the MATLAB IDE with a script titled 'Newton.m' in the editor. The script implements a Newton-Raphson method to find the root of a function. The user has entered 2 iterations, and the program has failed to achieve the tolerance of 0.000010 after 2 iterations. The Command Window shows the following output:

```
Enter number of iterations
2
Initial Guess is 4.500000 IVT
unsuccessful
Failed to achieve tolerance of 0.000010 after 2 iterations
fx >>
```

The Workspace window shows the following variables and their values:

Name	Value
a	4
b	5
f	@(x)x^2-17
fd	@(x)2*x
flag	0
h	1
i	3
N	2
tol	1.0000e-05
x0	4.1231
x1	4.1231

CODE:

```
%newton method
```

```
clc
```

```
clear
```

```
f=@(x) x^2-17;
```

```
fd=@(x)2*x;
```

```
tol=0.00001;
```

```
h=1;
```

```
flag=0;
```

```
%ivt
```

```
for i=-10:h:10
```

```
    if(f(i)*f(i+h)<0)
```

```

        a=i;
        b=i+h;
    end
end

N=input('Enter number of iterations \n');
x0=(a+b)/2;
fprintf('Initial Guess is %f IVT\n',x0);
%Newton Formula
i=1;
while i<=N

    x1= x0 - (f(x0)/fd(x0));
    if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
        flag=1;
        break

    else
        x0=x1;
        i=i+1;
    end

end

if flag~=1
    fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);
else
    fprintf('successfull\n');

```

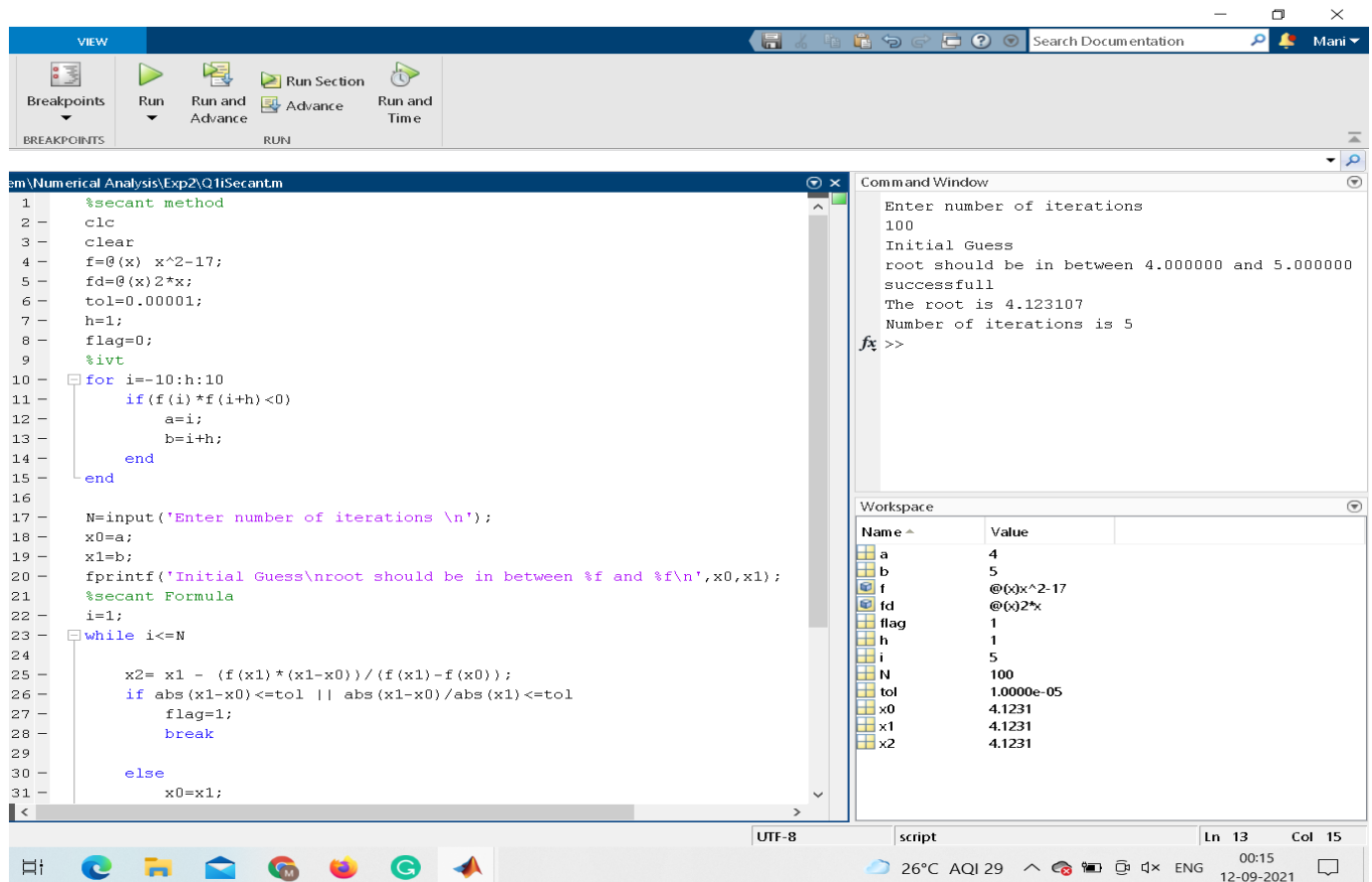
```
fprintf('The root is %f',x0);

fprintf('\nNumber of iterations is %d\n',i);

end
```

Ans1(i) by Secant Method

SUCCESSFUL:



The screenshot displays the MATLAB IDE with a script titled 'Exp2\Q1\Secant.m'. The script implements the Secant Method to find the root of the function $f(x) = x^2 - 17$. The initial guess is 4, and the number of iterations is set to 100. The script uses a while loop to iteratively refine the root until the tolerance is met. The Command Window shows the input and output, and the Workspace shows the variables.

Script Code:

```
1 %secant method
2 clc
3 clear
4 f=@(x) x^2-17;
5 fd=@(x) 2*x;
6 tol=0.00001;
7 h=1;
8 flag=0;
9 %ivt
10 for i=-10:h:10
11     if (f(i)*f(i+h)<0)
12         a=i;
13         b=i+h;
14     end
15 end
16
17 N=input('Enter number of iterations \n');
18 x0=a;
19 x1=b;
20 fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);
21 %secant Formula
22 i=1;
23 while i<=N
24
25     x2= x1 - (f(x1)*(x1-x0))/(f(x1)-f(x0));
26     if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
27         flag=1;
28         break
29     else
30
31         x0=x1;
```

Command Window Output:

```
Enter number of iterations
100
Initial Guess
root should be in between 4.000000 and 5.000000
successfull
The root is 4.123107
Number of iterations is 5
fx >>
```

Workspace Variables:

Name	Value
a	4
b	5
f	@(x)x^2-17
fd	@(x)2*x
flag	1
h	1
i	5
N	100
tol	1.0000e-05
x0	4.1231
x1	4.1231
x2	4.1231

UNSUCCESSFUL:

The screenshot shows the MATLAB IDE with a script file named 'Exp2' in the 'Numerical Analysis' folder. The script implements a secant method to find the root of the function $f(x) = x^2 - 17$. The user has entered 2 iterations. The output in the Command Window shows that the method failed to achieve the tolerance of 0.000010 after 2 iterations. The Workspace window shows the current values of the variables.

```
12 - a=1;
13 - b=i+h;
14 - end
15 - end
16 -
17 - N=input('Enter number of iterations \n');
18 - x0=a;
19 - x1=b;
20 - fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);
21 - %secant Formula
22 - i=1;
23 - while i<=N
24 -
25 -     x2= x1 - (f(x1)*(x1-x0))/(f(x1)-f(x0));
26 -     if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
27 -         flag=1;
28 -         break
29 -
30 -     else
31 -         x0=x1;
32 -         x1=x2;
33 -         i=i+1;
34 -     end
35 - end
36 -
37 - if flag~=1
38 -     fprintf('unsuccessful\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);
39 - else
40 -     fprintf('successful\n');
41 -     fprintf('The root is %f',x0);
42 -     fprintf('\nNumber of iterations is %d\n',i);
43 - end
```

Command Window

```
Enter number of iterations
2
Initial Guess
root should be in between 4.000000 and 5.000000
unsuccessful
Failed to achieve tolerance of 0.000010 after 2 iterations
fx >>
```

Workspace

Name	Value
a	4
b	5
f	@(x)x^2-17
fd	@(x)2*x
flag	0
h	1
i	3
N	2
tol	1.0000e-05
x0	4.1111
x1	4.1220
x2	4.1220

CODE:

%secant method

clc

clear

f=@(x) x^2-17;

fd=@(x)2*x;

tol=0.00001;

h=1;

flag=0;

%ivt

for i=-10:h:10

```

    if(f(i)*f(i+h)<0)
        a=i;
        b=i+h;
    end
end

N=input('Enter number of iterations \n');

x0=a;
x1=b;

fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);

%secant Formula

i=1;
while i<=N

    x2= x1 - (f(x1)*(x1-x0))/(f(x1)-f(x0));
    if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
        flag=1;
        break

    else
        x0=x1;
        x1=x2;
        i=i+1;
    end

end

end

if flag~=1

```

```

    fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);
else
    fprintf('successfull\n');
    fprintf('The root is %f',x0);
    fprintf('\nNumber of iterations is %d\n',i);
end

```

Ans1(ii) by Secant Method

SUCCESSFUL:

The image shows a MATLAB environment with the following components:

- Editor:** Contains a script named 'Exp2' with the following code:


```

1 %secant method
2 clc
3 clear
4 f=@(x) (exp(-x)*(x^2+5*x+2))+1;
5 tol=0.00001;
6 h=1;
7 flag=0;
8 %ivt
9 for i=-10:h:10
10     if (f(i)*f(i+h)<0)
11         a=i;
12         b=i+h;
13     end
14 end
15
16 N=input('Enter number of iterations \n');
17 x0=a;
18 x1=b;
19 fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);
20 %secant Formula
21 i=1;
22 while i<=N
23     x2= x1 - (f(x1)*(x1-x0))/(f(x1)-f(x0));
24     if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
25         flag=1;
26         break
27     else
28         x0=x1;
29         x1=x2;
30     end
31 end

```
- Command Window:** Shows the execution output:

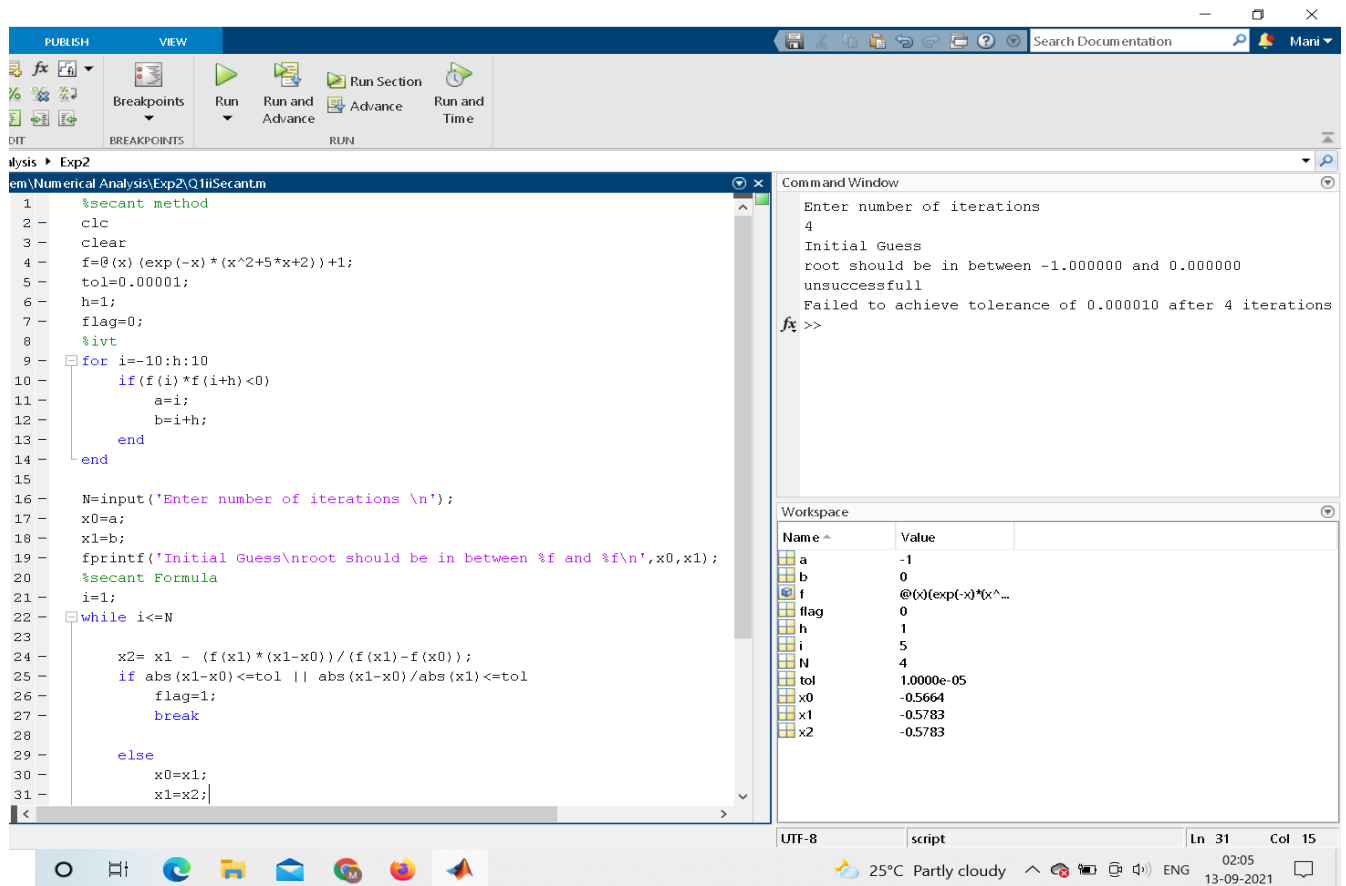

```

>>
Enter number of iterations
100
Initial Guess
root should be in between -1.000000 and 0.000000
successfull
The root is -0.579167
Number of iterations is 7
>>

```
- Workspace:** Displays the current workspace variables:

Name	Value
a	-1
b	0
f	@(x)(exp(-x)*(x^2+5*x+2))+1
flag	1
h	1
i	7
N	100
tol	1.0000e-05
x0	-0.5792
x1	-0.5792
x2	-0.5792

UNSUCCESSFUL:



CODE:

%secant method

clc

clear

f=@(x)(exp(-x)*(x^2+5*x+2))+1;

tol=0.00001;

h=1;

flag=0;

%ivt

for i=-10:h:10

if(f(i)*f(i+h)<0)


```

        a=i;
        b=i+h;
    end
end

N=input('Enter number of iterations \n');
x0=a;
x1=b;
fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);
%secant Formula
i=1;
while i<=N

    x2= x1 - (f(x1)*(x1-x0))/(f(x1)-f(x0));
    if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
        flag=1;
        break

    else
        x0=x1;
        x1=x2;
        i=i+1;
    end

end

if flag~=1
    fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);

```

else

```
fprintf('successfull\n');
```

```
fprintf('The root is %f',x0);
```

```
fprintf('\nNumber of iterations is %d\n',i);
```

end

Ans1(ii) by Newton Method

SUCCESSFUL:

The image shows a MATLAB script window with the following code:

```
1 %newton method
2 clc
3 clear
4 f=@(x) (exp(-x)*(x^2+5*x+2))+1;
5 fd=@(x) (-exp(-x)*(x^2+5*x+2))+(exp(-x)*(2*x+5));
6 tol=0.00001;
7 h=1;
8 flag=0;
9 %ivt
10
11 N=input('Enter number of iterations \n');
12 x0=-1;
13 fprintf('Initial Guess is %f as given in question\n',x0);
14 %Newton Formula
15 i=1;
16 while i<=N
17     x1= x0 - (f(x0)/fd(x0));
18     if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
19         flag=1;
20         break
21     else
22         x0=x1;
23         i=i+1;
24     end
25 end
26 if flag~=1
27     fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d :',tol,N);
28 end
29 else
30     fprintf('successfull\n');
31 end
```

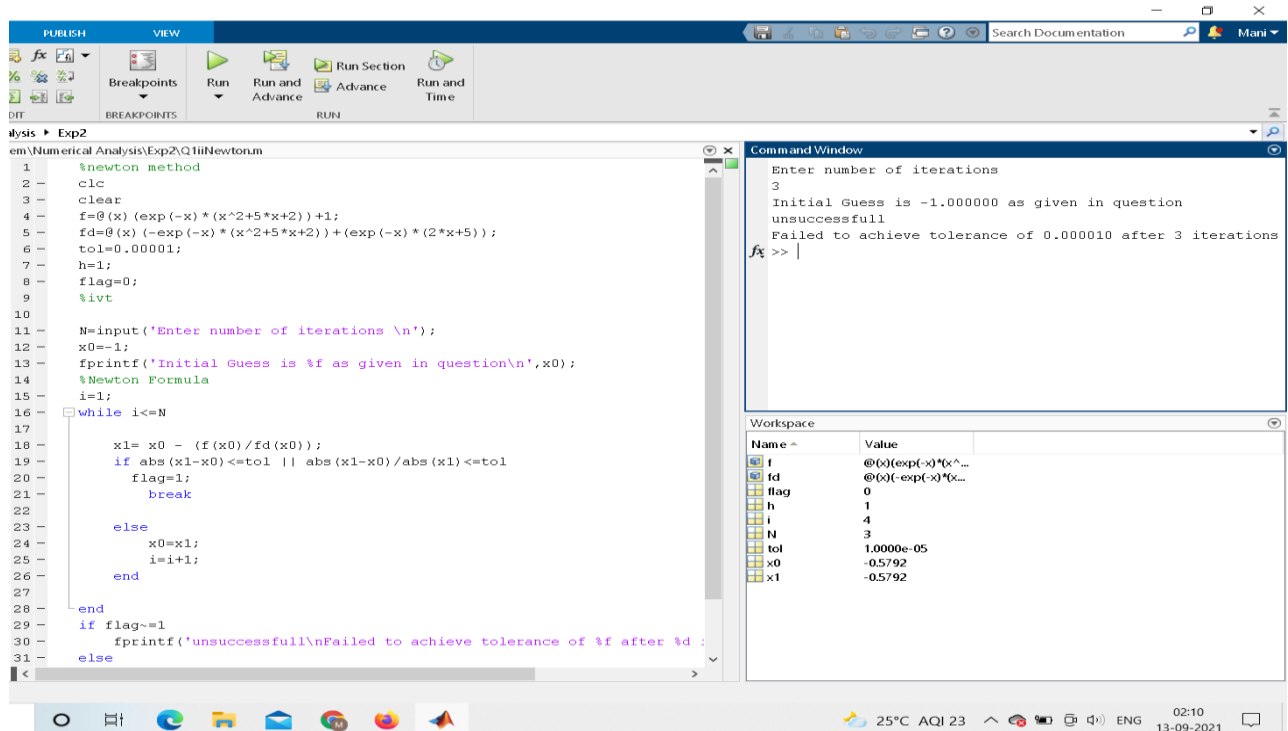
The Command Window shows the following output:

```
Enter number of iterations
100
Initial Guess is -1.000000 as given in question
successfull
The root is -0.579159
Number of iterations is 5
```

The Workspace window shows the following variables:

Name	Value
f	@(x)(exp(-x)*(x^2+5*x+2))+1
fd	@(x)(-exp(-x)*(x^2+5*x+2))+(exp(-x)*(2*x+5))
flag	1
h	1
i	5
N	100
tol	1.0000e-05
x0	-0.5792
x1	-0.5792

UNSUCCESSFUL:



CODE:

```
%newton method
```

```
clc
```

```
clear
```

```
f=@(x)(exp(-x)*(x^2+5*x+2))+1;
```

```
fd=@(x)(-exp(-x)*(x^2+5*x+2)+(exp(-x)*(2*x+5)));
```

```
tol=0.00001;
```

```
h=1;
```

```
flag=0;
```

```
%ivt
```

```
N=input('Enter number of iterations \n');
```

```
x0=-1;
```

```
fprintf('Initial Guess is %f as given in question\n',x0);
```

```
%Newton Formula
```

```

i=1;
while i<=N

    x1= x0 - (f(x0)/fd(x0));
    if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
        flag=1;
        break

    else
        x0=x1;
        i=i+1;
    end

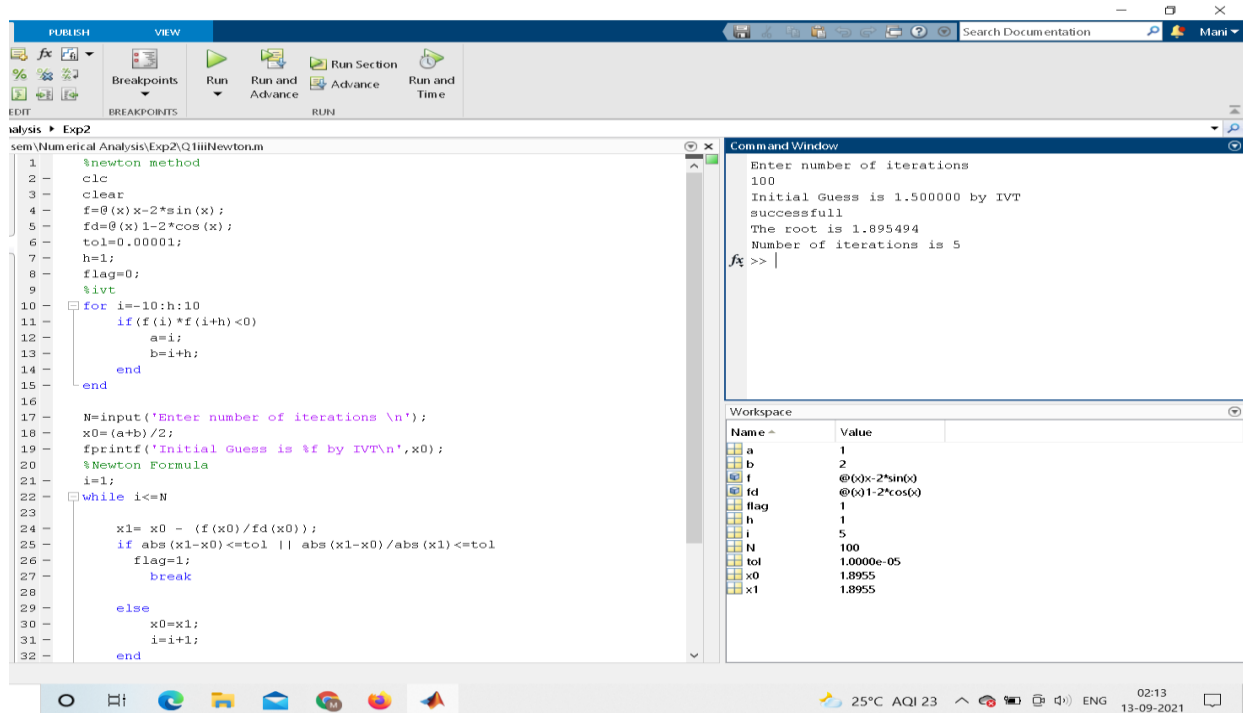
end

if flag~=1
    fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);
else
    fprintf('successfull\n');
    fprintf('The root is %f',x0);
    fprintf('\nNumber of iterations is %d\n',i);
end

```

Ans1(iii) by Newton Method

SUCCESSFUL:



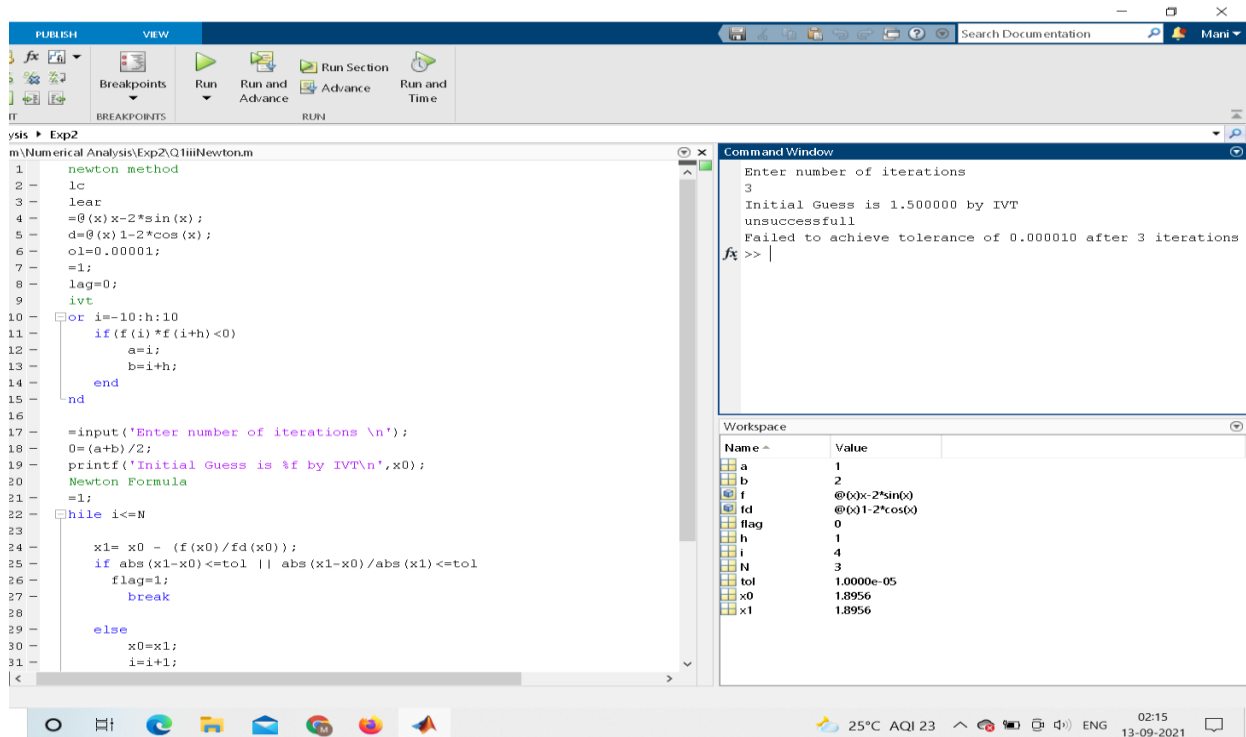
```
1 %newton method
2 clc
3 clear
4 f=@(x)x-2*sin(x);
5 fd=@(x)1-2*cos(x);
6 tol=0.00001;
7 h=1;
8 flag=0;
9 %ivt
10 for i=-10:h:10
11     if (f(i)*f(i+h)<0)
12         a=i;
13         b=i+h;
14     end
15 end
16
17 N=input('Enter number of iterations \n');
18 x0=(a+b)/2;
19 fprintf('Initial Guess is %f by IVT\n',x0);
20 %Newton Formula
21 i=1;
22 while i<=N
23     x1= x0 - (f(x0)/fd(x0));
24     if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
25         flag=1;
26         break
27     else
28         x0=x1;
29         i=i+1;
30     end
31 end
32
```

Command Window

```
Enter number of iterations
100
Initial Guess is 1.500000 by IVT
successfull
The root is 1.895494
Number of iterations is 5
fx >>
```

Name	Value
a	1
b	2
f	@(x)x-2*sin(x)
fd	@(x)1-2*cos(x)
flag	1
h	1
i	5
N	100
tol	1.0000e-05
x0	1.8955
x1	1.8955

UNSUCCESSFUL:



CODE:

```
%newton method
```

```
clc
```

```
clear
```

```
f=@(x)x-2*sin(x);
```

```
fd=@(x)1-2*cos(x);
```

```
tol=0.00001;
```

```
h=1;
```

```
flag=0;
```

```
%ivt
```

```
for i=-10:h:10
```

```
    if(f(i)*f(i+h)<0)
```

```
        a=i;
```

```
        b=i+h;
```

```
    end
```

end

N=input('Enter number of iterations \n');

x0=(a+b)/2;

fprintf('Initial Guess is %f by IVT\n',x0);

%Newton Formula

i=1;

while i<=N

 x1= x0 - (f(x0)/fd(x0));

 if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol

 flag=1;

 break

 else

 x0=x1;

 i=i+1;

 end

end

if flag~=1

 fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);

else

 fprintf('successfull\n');

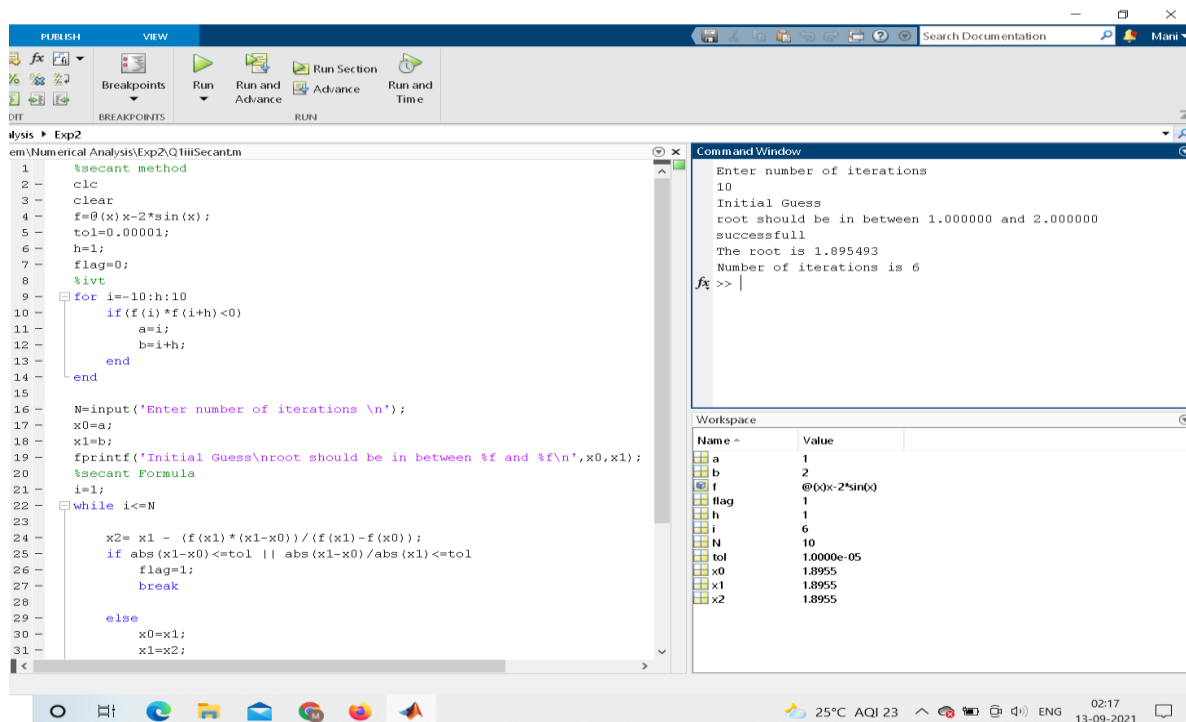
 fprintf('The root is %f',x0);

 fprintf('\nNumber of iterations is %d\n',i);

end

Ans1(iii) by Secant Method

SUCCESSFUL:



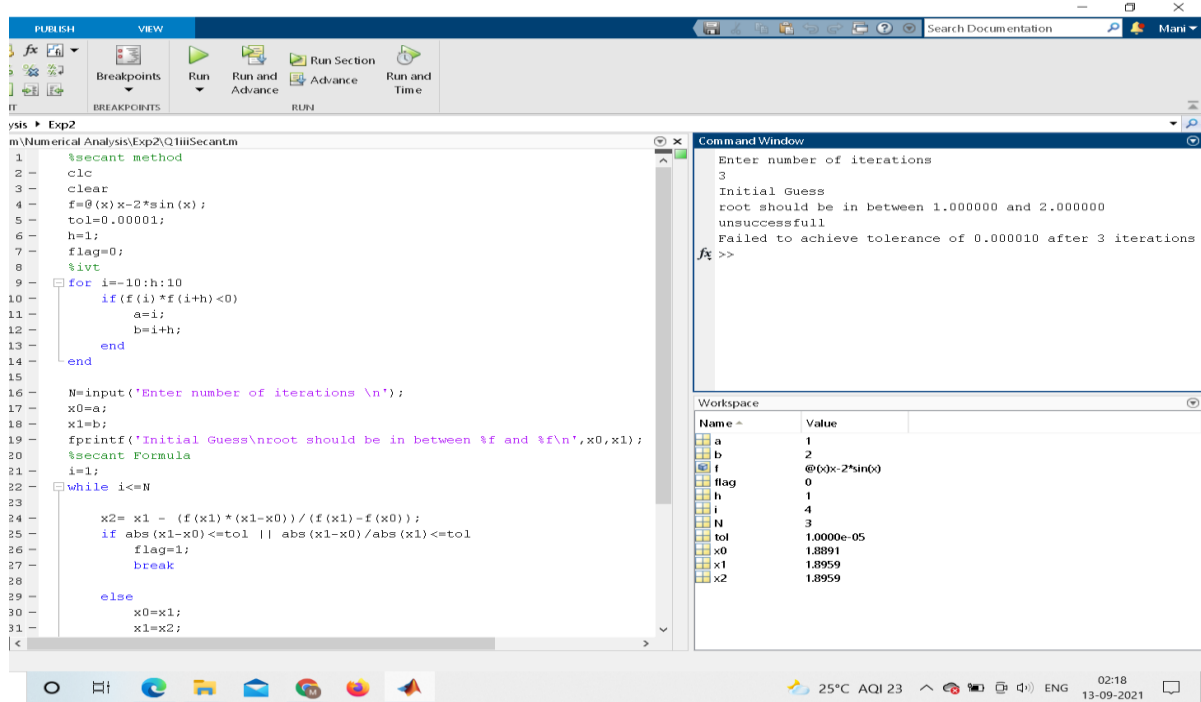
```
1 %secant method
2 clc
3 clear
4 f=@(x) x-2*sin(x);
5 tol=0.00001;
6 h=1;
7 flag=0;
8 %ivt
9 for i=-10:h:10
10     if (f(i)*f(i+h)<0)
11         a=i;
12         b=i+h;
13     end
14 end
15
16 N=input('Enter number of iterations \n');
17 x0=a;
18 x1=b;
19 fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);
20 %secant Formula
21 i=1;
22 while i<=N
23     x2= x1 - (f(x1)*(x1-x0))/(f(x1)-f(x0));
24     if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
25         flag=1;
26         break;
27     else
28         x0=x1;
29         x1=x2;
30     end
31 end
```

Command Window

```
Enter number of iterations
10
Initial Guess
root should be in between 1.000000 and 2.000000
successful
The root is 1.895493
Number of iterations is 6
fx >> |
```

Name	Value
a	1
b	2
f	@(x)x-2*sin(x)
flag	1
h	1
i	6
N	10
tol	1.0000e-05
x0	1.8955
x1	1.8955
x2	1.8955

UNSUCCESSFUL:



CODE:

```
%secant method
```

```
clc
```

```
clear
```

```
f=@(x)x-2*sin(x);
```

```
tol=0.00001;
```

```
h=1;
```

```
flag=0;
```

```
%ivt
```

```
for i=-10:h:10
```

```
    if(f(i)*f(i+h)<0)
```

```
        a=i;
```

```
        b=i+h;
```

```
    end
```

end

N=input('Enter number of iterations \n');

x0=a;

x1=b;

fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);

%secant Formula

i=1;

while i<=N

$$x2 = x1 - (f(x1) * (x1 - x0)) / (f(x1) - f(x0));$$

if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol

flag=1;

break

else

x0=x1;

x1=x2;

i=i+1;

end

end

if flag~=1

fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);

else

fprintf('successfull\n');

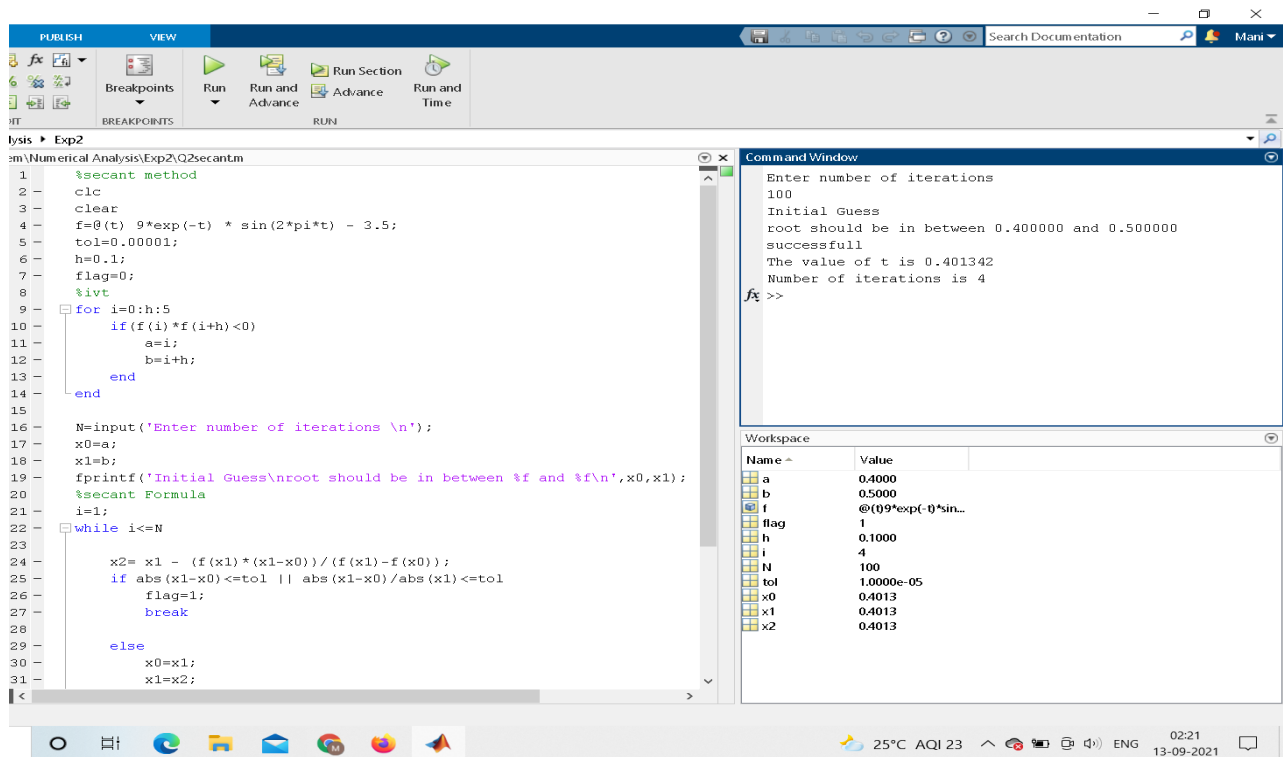
fprintf('The root is %f',x0);

```
fprintf('\nNumber of iterations is %d\n',i);
end
```

Q2

4. An oscillating current in an electric circuit is described by $i = 9e^{-t} \sin(2\pi t)$, where t is in seconds. Determine the lowest value of t such that $i = 3.5$.

Ans2 by Secant Method



CODE:

```
%secant method

clc

clear
```

```

f=@(t) 9*exp(-t) * sin(2*pi*t) - 3.5;
tol=0.00001;
h=0.1;
flag=0;
%ivt
for i=0:h:5
    if(f(i)*f(i+h)<0)
        a=i;
        b=i+h;
    end
end

N=input('Enter number of iterations \n');
x0=a;
x1=b;
fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);
%secant Formula
i=1;
while i<=N

    x2= x1 - (f(x1)*(x1-x0))/(f(x1)-f(x0));
    if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
        flag=1;
        break

    else
        x0=x1;

```

```

        x1=x2;

        i=i+1;

    end

end

if flag~=1

    fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);

else

    fprintf('successfull\n');

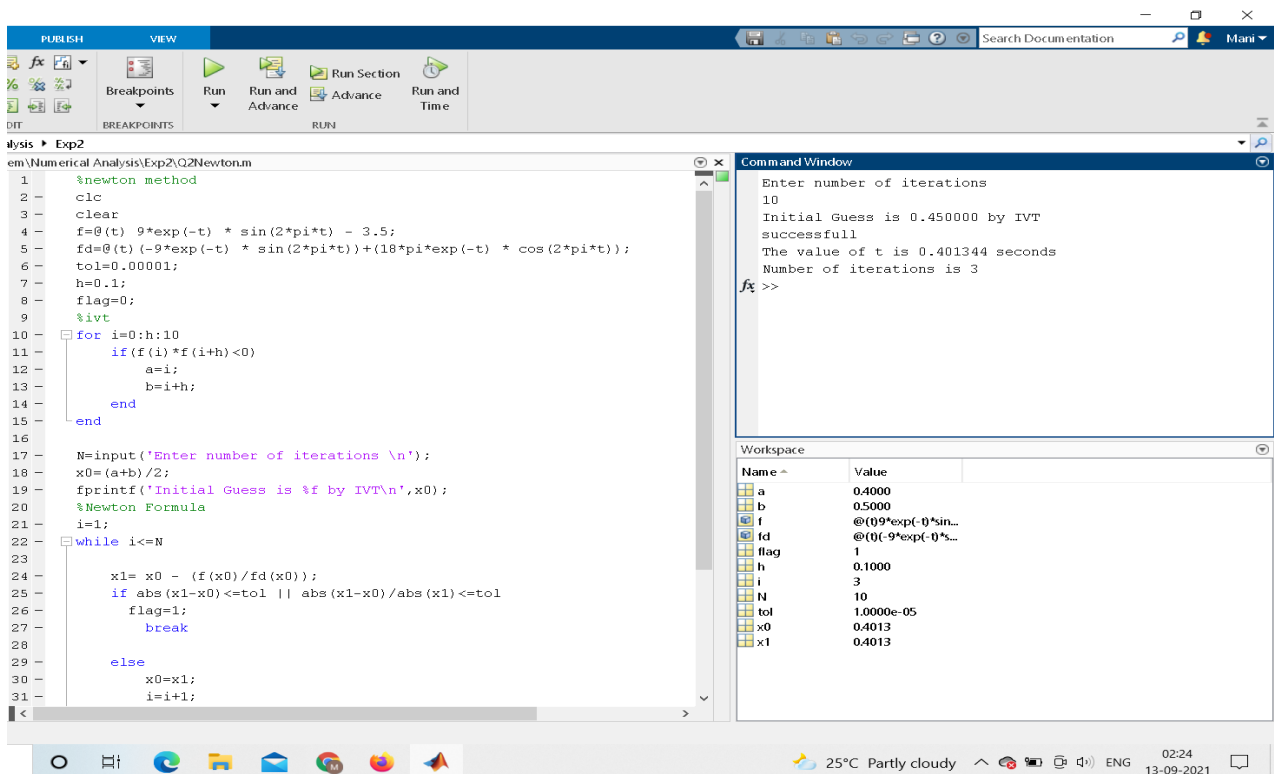
    fprintf('The value of t is %f',x0);

    fprintf('\nNumber of iterations is %d\n',i);

end

```

Ans2 by Newton Method



The image shows a MATLAB script implementing the Newton-Raphson method to find the root of a function. The script is titled 'Exp2' and is located in the file 'em\Numerical Analysis\Exp2\Q2Newton.m'.

Script Code:

```

1  %newton method
2  clc
3  clear
4  f=@(t) 9*exp(-t) * sin(2*pi*t) - 3.5;
5  fd=@(t) (-9*exp(-t) * sin(2*pi*t))+(18*pi*exp(-t) * cos(2*pi*t));
6  tol=0.00001;
7  h=0.1;
8  flag=0;
9  %ivt
10 for i=0:h:10
11     if (f(i)*f(i+h)<0)
12         a=i;
13         b=i+h;
14     end
15 end
16
17 N=input('Enter number of iterations \n');
18 x0=(a+b)/2;
19 fprintf('Initial Guess is %f by IVT\n',x0);
20 %Newton Formula
21 i=1;
22 while i<=N
23
24     x1= x0 - (f(x0)/fd(x0));
25     if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
26         flag=1;
27         break
28     else
29         x0=x1;
30         i=i+1;
31     end
32 end

```

Command Window Output:

```

Enter number of iterations
10
Initial Guess is 0.450000 by IVT
successfull
The value of t is 0.401344 seconds
Number of iterations is 3
fx >>

```

Workspace Variables:

Name	Value
a	0.4000
b	0.5000
f	@(t)9*exp(-t)*sin...
fd	@(t)(-9*exp(-t)*...
flag	1
h	0.1000
i	3
N	10
tol	1.0000e-05
x0	0.4013
x1	0.4013

CODE:

```
%newton method

clc

clear

f=@(t) 9*exp(-t) * sin(2*pi*t) - 3.5;
fd=@(t)(-9*exp(-t) * sin(2*pi*t))+(18*pi*exp(-t) * cos(2*pi*t));

tol=0.00001;

h=0.1;

flag=0;

%ivt

for i=0:h:10

    if(f(i)*f(i+h)<0)

        a=i;

        b=i+h;

    end

end

N=input('Enter number of iterations \n');

x0=(a+b)/2;

fprintf('Initial Guess is %f by IVT\n',x0);

%Newton Formula

i=1;

while i<=N

    x1= x0 - (f(x0)/fd(x0));

    if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol

        flag=1;
```

```
        break

    else

        x0=x1;

        i=i+1;

    end

end

if flag~=1

    fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);

else

    fprintf('successfull\n');

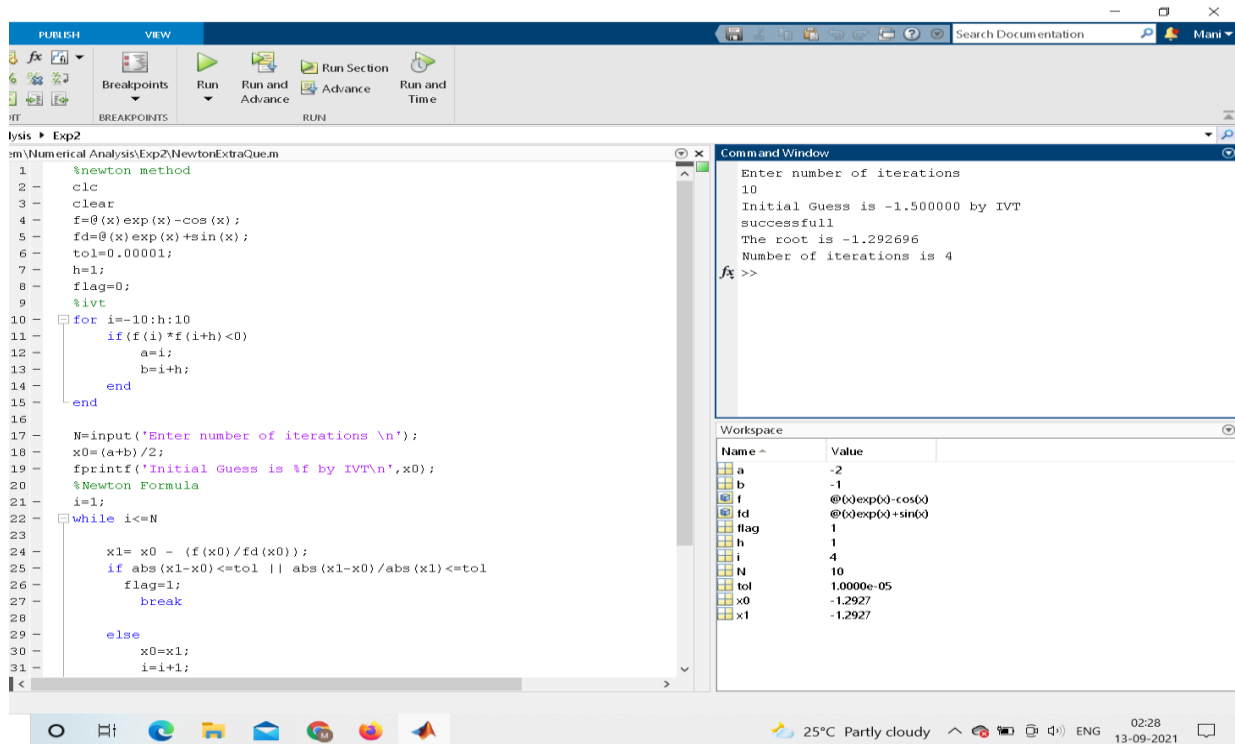
    fprintf('The value of t is %f seconds',x0);

    fprintf('\nNumber of iterations is %d\n',i);

end
```

EXTRA QUES GIVEN: $\exp(x)=\cos(x)$

Ans by Newton Method



CODE:

```
%newton method
```

```
clc
```

```
clear
```

```
f=@(x)exp(x)-cos(x);
```

```
fd=@(x)exp(x)+sin(x);
```

```
tol=0.00001;
```

```
h=1;
```

```
flag=0;
```

```
%ivt
```

```
for i=-10:h:10
```

```
    if(f(i)*f(i+h)<0)
```

```
        a=i;
```

```
        b=i+h;
```

```
    end
```


end

N=input('Enter number of iterations \n');

x0=(a+b)/2;

fprintf('Initial Guess is %f by IVT\n',x0);

%Newton Formula

i=1;

while i<=N

 x1= x0 - (f(x0)/fd(x0));

 if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol

 flag=1;

 break

 else

 x0=x1;

 i=i+1;

 end

end

if flag~=1

 fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations\n',tol,N);

else

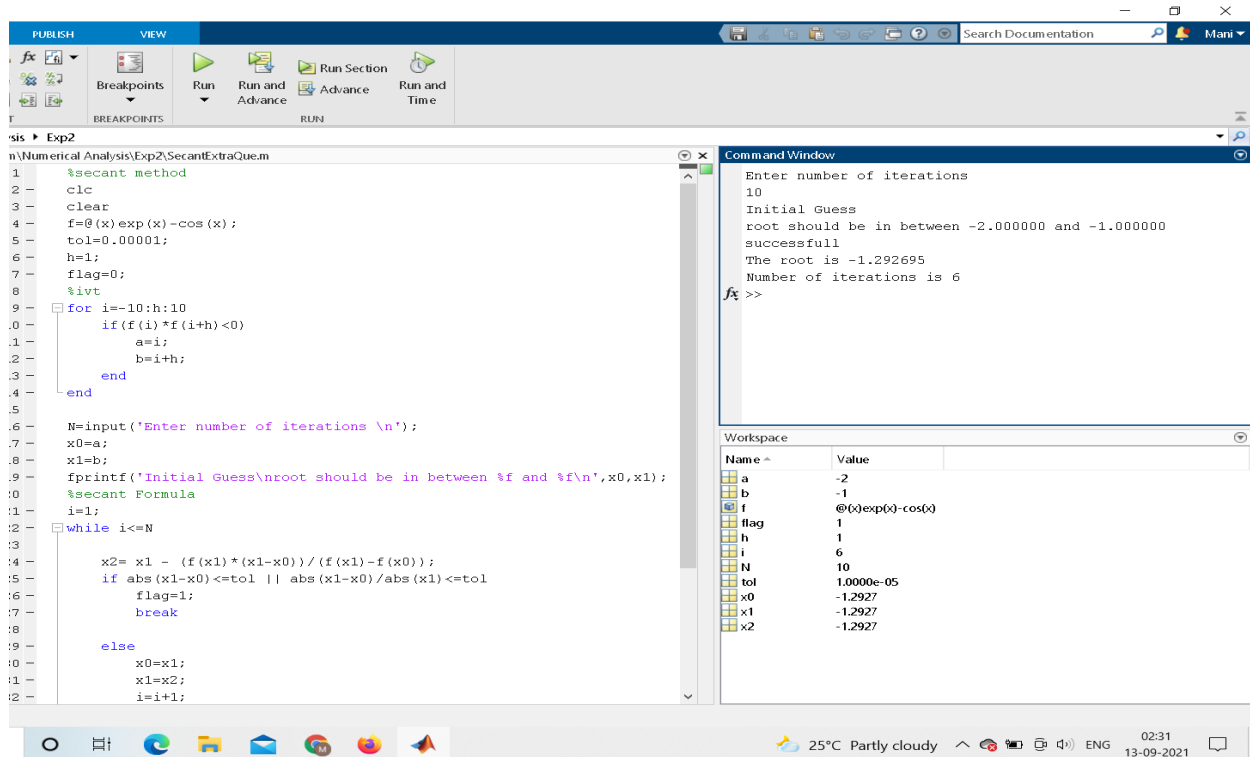
 fprintf('successfull\n');

 fprintf('The root is %f',x0);

 fprintf('\nNumber of iterations is %d\n',i);

end

Ans by Secant Method



```
1 %secant method
2 clc
3 clear
4 f=@(x)exp(x)-cos(x);
5 tol=0.00001;
6 h=1;
7 flag=0;
8 %ivt
9 for i=-10:h:10
10     if (f(i)*f(i+h)<0)
11         a=i;
12         b=i+h;
13     end
14 end
15 N=input('Enter number of iterations \n');
16 x0=a;
17 x1=b;
18 fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);
19 %secant Formula
20 i=1;
21 while i<=N
22     x2= x1 - (f(x1)*(x1-x0))/(f(x1)-f(x0));
23     if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
24         flag=1;
25         break
26     else
27         x0=x1;
28         x1=x2;
29         i=i+1;
30     end
31 end
```

Command Window

```
Enter number of iterations
10
Initial Guess
root should be in between -2.000000 and -1.000000
successfull
The root is -1.292695
Number of iterations is 6
fx >>
```

Name	Value
a	-2
b	-1
f	@(x)exp(x)-cos(x)
flag	1
h	1
i	6
N	10
tol	1.0000e-05
x0	-1.2927
x1	-1.2927
x2	-1.2927

CODE:

```
%secant method
```

```
clc
```

```
clear
```

```
f=@(x)exp(x)-cos(x);
```

```
tol=0.00001;
```

```
h=1;
```

```
flag=0;
```

```
%ivt
```

```
for i=-10:h:10
```

```
    if(f(i)*f(i+h)<0)
```

```
        a=i;
```

```
        b=i+h;
```

```

    end
end

N=input('Enter number of iterations \n');
x0=a;
x1=b;
fprintf('Initial Guess\nroot should be in between %f and %f\n',x0,x1);
%secant Formula
i=1;
while i<=N

    x2= x1 - (f(x1)*(x1-x0))/(f(x1)-f(x0));
    if abs(x1-x0)<=tol || abs(x1-x0)/abs(x1)<=tol
        flag=1;
        break

    else
        x0=x1;
        x1=x2;
        i=i+1;
    end

end

end

if flag~=1
    fprintf('unsuccessfull\nFailed to achieve tolerance of %f after %d iterations',tol,N);
else
    fprintf('successfull\n');

```

```
fprintf('The root is %f',x0);  
fprintf('\nNumber of iterations is %d\n',i);  
end
```