

INSTITUTE OF INFORMATION TECHNOLOGY JAHANGIRNAGAR UNIVERSITY

Lab Report : 04

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Course Tittle : Numerical Analysis Lab

Course Code : ICT - 2106

Submitted To

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Professor

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IIT - JU

1. Write programs to find the real root of the following equations by using **Newton Raphson** Method.

- a) $f(x) = x^3 3x 1 = 0$ correct to 5 decimal point, near
- b) $x \sin x + \cos x = 0$; correct to 5 decimal point, near x=3
- c) $x = e^{-x}$ correct to 5decimal point, near x=2

Problem 1(a).

Code:

```
clear all;
format LONG
f = @(x) x^3 - 3*x -1;
dif = @(x) 3*x^2 - 3;
x=0;
fprintf('\nX\t\tRoot\n');
fprintf('----\n');
for i = 1:3
   if (i==2)
       x=2;
   end
   if (i==3)
       x = -2;
   end
    fprintf('%d',x);
    for j = 1:100
           x1 = x - (f(x)/dif(x));
           if(abs(x-x1)<10^{(-5)})
        break;
    else
        x=x1;
    end
    end
     fprintf('\t\t\t\t,x1);
     fprintf('\n');
end
```

Output:

```
>> Lab4_Problem1a

X Root

-----

0 -0.347296

2 1.879385

-2 -1.532089
```

Problem 1(b).

Code:

Output:

>> Lab4_Problem1b

Root is: 2.798386

Problem 1(c).

Code:

Output:

>> Lab4_Problem1c

Root is: 0.567143

2. How does the program act if the starting value of x is 1? Explain the reason behind it.

Problem 2(a).

Code:

Output:

>> Lab4_Problem2a

Root is: NaN

Problem 2(b).

Code:

Output:

>> Lab4_Problem2b

Root is: 56.530984

Problem 2(c).

Code:

Output:

>> Lab4_Problem2c

Root is: 0.567143

3. Solve 1 (a) using **roots**, **fzero**, **fsolve** Matlab function

Problem 3.

Code:

```
clear all;
m = [1 \ 0 \ -3 \ -1]
r=roots(m)
f = @(x) x^3 -3*x -1;
dif = @(x) 3*x^2 - 3;
x=0;
fprintf('\nX\t\tfzero\n');
fprintf('----\n');
for i = 1:3
   if (i==2)
       x=2;
   end
   if (i==3)
       x=-2;
   end
    fprintf('%d',x);
    for j = 1:3
          n=fzero(f,x);
    end
     fprintf('\t\t%f\t\t',n);
     fprintf('\n');
end
```

Output:

```
>> Lab4_Problem3

m =

1  0 -3 -1
```

r =

- 1.879385241571817
- -1.532088886237957
- -0.347296355333861

Χ	fzero
0	-0.347296
2	1.879385
-2	-1.532089

FSOLVE

When x=0

 $>> p=fsolve(@(x)x^3-3*x-1,0)$

Equation solved.

fsolve completed because the vector of function values is near zero as measured by the default value of the function tolerance, and the problem appears regular as measured by the gradient.

<stopping criteria details>

p =

-0.3473

```
When x=2
```

```
>> p=fsolve(@(x)x^3-3*x-1,2)
```

Equation solved.

fsolve completed because the vector of function values is near zero as measured by the default value of the function tolerance, and the problem appears regular as measured by the gradient.

<stopping criteria details>

p =

1.8794

When x=-2

```
>> p=fsolve(@(x)x^3-3*x-1,-2)
```

Equation solved.

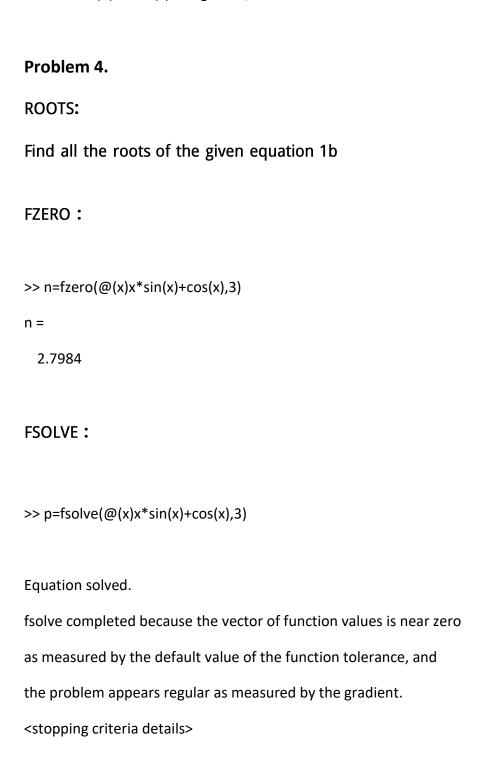
fsolve completed because the vector of function values is near zero as measured by the default value of the function tolerance, and the problem appears regular as measured by the gradient.

<stopping criteria details>

p =

-1.5321

4. Solve 1(b) and 1(c) using fzero, fsolve Matlab function



p =

2.7984

ROOTS:

Find all the roots of the given equation 1c

FZERO:

```
>> n=fzero(@(x)x-exp(-x),2)
```

n =

0.5671

FSOLVE:

```
>> p=fsolve(@(x)x-exp(-x),2)
```

Equation solved.

fsolve completed because the vector of function values is near zero as measured by the default value of the function tolerance, and the problem appears regular as measured by the gradient.

<stopping criteria details>

p =

0.5671

THE END