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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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%f\t\t',x1);
     fprintf('\n');
end
```

Output:

```
>> Lab4_Problem1a

X              Root

---------------------------

0              -0.347296

2              1.879385

-2             -1.532089
```

Problem 1(b).

Code:

```
clear all;
format LONG
f = @(x) x*sin(x)+ cos(x);
dif = @(x) x*(cos(x));
x=3;

for i = 1:100
       x1 = x - (f(x)/dif(x));
       if(abs(x-x1)<10^(-5))
       break;
    else
        x=x1;
    end
end
fprintf('\nRoot is: %f\n', x)
```

Output:

```
>> Lab4_Problem1b

Root is: 2.798386
```

Problem 1(c).

Code:

```
clear all;
format LONG
f = @(x) x-exp(-x);
dif = @(x) 1+exp(-x);
x=3;

for i = 1:100
       x1 = x - (f(x)/dif(x));
       if(abs(x-x1)<10^(-5))
       break;
    else
        x=x1;
    end
end
fprintf('\nRoot is: %f\n', x)
```

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:

```
clear all;
format LONG
f = @(x) x^3 -3*x -1;
dif = @(x) 3*x^2 - 3;
x=1;

    for j = 1:3
        x1 = x - (f(x)/dif(x));
        if(abs(x-x1)<10^(-5))
        break;
    else
        x=x1;
    end

end
fprintf('\nRoot is: %f\n', x)
```

Output:

```
>> Lab4_Problem2a


Root is: NaN
```

Problem 2(b).

Code:

```
clear all;
format LONG
f = @(x) x*sin(x)+ cos(x);
dif = @(x) x*(cos(x));
x=1;

for i = 1:100
        x1 = x - (f(x)/dif(x));
        if(abs(x-x1)<10^(-5))
        break;
    else
        x=x1;
    end
end
fprintf('\nRoot is: %f\n', x)
```

Output:

>> Lab4_Problem2b

Root is: 56.530984

Problem 2(c).

Code:

```
clear all;
format LONG
f = @(x) x-exp(-x);
dif = @(x) 1+exp(-x);
x=1;

for i = 1:100
       x1 = x - (f(x)/dif(x));
       if(abs(x-x1)<10^(-5))
       break;
    else
        x=x1;
    end
end
fprintf('\nRoot is: %f\n', x)
```

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

X	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

Problem 4.

ROOTS:

Find all the roots of the given equation 1b

FZERO :

```
>> n=fzero(@(x)x*sin(x)+cos(x),3)
n =
   2.7984
```

FSOLVE :

```
>> p=fsolve(@(x)x*sin(x)+cos(x),3)

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 =
   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