Newton's Algorithm Class

A. Function

We toke example last lecture if we use this way to solve or problem that we need in the Bisection methods to solve the numerical problem.

Example:-

You have to write this steps in the Editor as following

```
function y=f(x)
% the integration of y=cos(x)-x
y=cos(x)-x;
```

Then save it under **f.m .**
After you save it by using the **File** and **save as .**
Then go to command page that you will write the variable that you need to calculate.

>> f(pi)
Result will be as following:

```
ans =

    -4.1416
```

```
function k=df(dx)
% the diff. of the function
k=-sin(dx)-1;
```

Then save it under **fn.m .**
After you save it by using the **File** and **save as .**
Then go to command page that you will write the variable that you need to calculate.

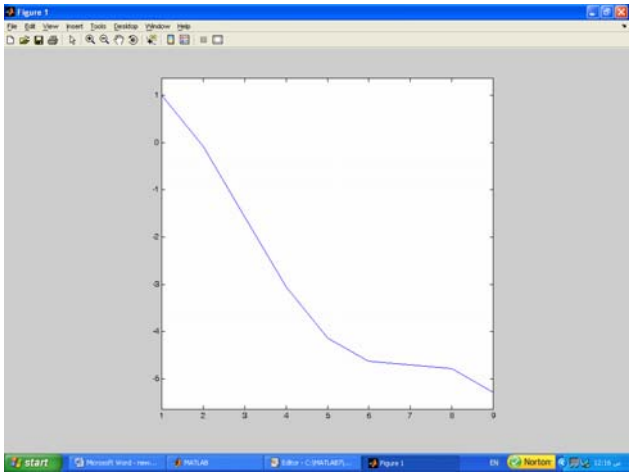
>> fn(pi)

ans =

-1.0000

B. The problem

Find the zero of the function cos(x)-x.



Show the step of the problem way to solve it as following

1st. *General Steps of Newton's from the Book:---*

Steps	The Condition
Step 1	i=1
Step 2	while i<=n
Step 3	p=po-f(po)/f'(po)
Step 4	if | p-po | <TOL OUTPUT p STOP
Step 5	i=i+1
Step 6	Po=p
Step 7	OUTPUT ('Mathod failed after n iteration ') STOP

Read this steps before copy the program from the note.

Steps as following :-

MATLAB program	The description
clc	This for clean the commend page
clear	This for remove any variable with the same name
po=pi/4;	The initial value of the function
%f=cos(x)-x;	The % is for labuling only the function that we analysis
%fn=-sin(x)-1;	The % is for labuling only the function that we analysis
i=1;	The initial value of the loop
n=6;	The number of iteration
pt=f(po)/fn(po)	Part of the Newton's Method
while i<=n	The while state
p=po-pt;	The other part of the Newtos's equation to be completed
if abs(p-po) <n	The condition
p	To print the result
break	To stop the previous condition
end	To end the if statement
i=i+1;	To add the loop iteration
po=p;	The Newton's method to operate with other iteration
disp('Mathod failed after n iteration ')	Print the result if it is not correct
end	To end the while loop

The should make the iteration for small number before put n=5.

The should get the answer as following from the po=pi/4;

p =

0.7395

2nd. *Solving by other way for Newton's method*

1st The function problem

Go to commend windows then write the following equation

s=@(x) –x^2;

function or the equation that you need as be for and compare the result that you get with the known one.

The result of s(5) is as following

```
>> s(5)

ans =

  -25
```

2nd The Newton's method using the function handle

The example as following:---

```
function [p0,err,k,y]=newton(f,df,p0,delta,epsilon,max1)
clc
%Input - f is the object function input as a string 'f'
%      - df is the derivative of f input as a string 'df'
%      - p0 is the initial approximation to a zero of f
%           - delta is the tolerance for p0
%           - epsilon is the tolerance for the function values y
%           - max1 is the maximum number of iterations
%Output - p0 is the Newton-Raphson approximation to the zero
%           - err is the error estimate for p0
%           - k is the number of iterations
%           - y is the function value f(p0)
%  NUMERICAL METHODS: Matlab Programs
% (c) 2004 by John H. Mathews and Kurtis D. Fink
%  Complementary Software to accompany the textbook:
%  NUMERICAL METHODS: Using Matlab, Fourth Edition

for k=1:max1
        p1=p0-feval(f,p0)/feval(fn,p0);
        err=abs(p1-p0);
        relerr=2*err/(abs(p1)+delta);
        p0=p1;
        y=feval(f,p0);
        if (err<delta)|(relerr<delta)|(abs(y)<epsilon),break,end
end
```

---

write this in command windows:

```
newton(f,df,pi,2,3,10)
```

the result should be as following

ans =

-1.0000

Duty for next class

The assignment for lecture is to make structure of Secant and gausses Elimination at home before come to the class.