

Bisection Algorithm Class

A. Function

We take 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 X^3
y=x^3;
```

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(2)
```

Result will be as following:

```
ans =
```

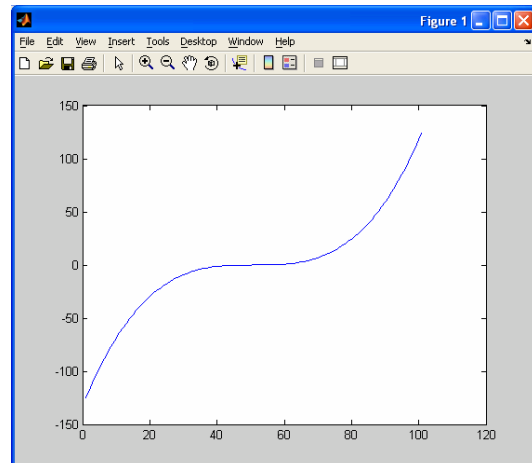
```
8
```

.....

B. The problem

Find the zero of the function
 X^3 .

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



1st. General Steps of Bisection from the Book:---

Steps	The Condition
Step 1	$i=1$
Step 2	while $i \leq n$ $p = a + (b-a)/2$
Step 3	if $f(p) = 0$ or $(b-a)/2 < \text{TOL}$ OUTPUT p STOP
Step 4	$i = i + 1$
Step 5	if $f(a) f(b) > 0$ $a = p$; else $b = p$
Step 6	OUTPUT ('Method 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
%f(x)=x^3;	The % is for labuling only the function that we analysis
a=-1;	The initial value of the function
b=4;	The final value of the function
i=1;	The initial value of the loop
n=10;	The number of iteration
while i<=n	The while state
p=a+(b-a)/2;	Condition
if f(p)==0 (b-a)/2<n	The other condition to see the function of the Bisection
p	To print the result
end	To stop the previous condition
i=i+1;	To add the loop iteration
if f(a)*f(b)>0	The other condition
a=p;	The Bisection method
else b=p;	The Bisection method
disp('Mathod failed after n iteration ')	Print the result if it is not correct
end	End the previous if
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 n=3 a=-1; b=4;

p =

1.5000

Method failed after n iteration

p =

0.2500

Method failed after n iteration

p =

-0.3750

Method failed after n iteration

The should get the answer as following from the $n=5$ $a=-1$; $b=4$;

p =

1.5000

Method failed after n iteration

p =

0.2500

Method failed after n iteration

p =

-0.3750

Method failed after n iteration

p =

-0.6875

p =

-0.5313

If the $n=18$ we can see that the result is fixed in the final value

p =

0.5000

Method failed after n iteration

p =

-0.2500

Method failed after n iteration

p =

-0.6250

p =

-0.4375

p =

-0.3438

p =

-0.2969

p =

-0.2734

p =

-0.2617

p =

-0.2559

p =

-0.2529

p =

-0.2515

p =

-0.2507

p =

-0.2504

p =

-0.2502

p =

-0.2501

p =

-0.2500

p =

-0.2500

p =

-0.2500

Other function they should use as the following

$$F(x)=x^3+4x^2-10 \quad a=1 \quad b=2$$

First the method must check the condition that $f(a)*f(b)>0$

Then the following

You should change the n , a and b .

p =

1.5000

Method failed after n iteration

p =

1.2500

Method failed after n iteration

p =

1.1250

p =

1.1875

p =

1.2188

p =

1.2344

p =

1.2422

p =

1.2461

p =

1.2480

If the n=18 we can see that the result is fixed in the final value

p =

1.5000

Method failed after n iteration

p =

1.2500

Method failed after n iteration

p =

1.1250

p =

1.1875

p =

1.2188

p =

1.2344

p =

1.2422

p =

1.2461

p =

1.2480

p =

1.2490

p =

1.2495

p =

1.2498

p =

1.2499

p =

1.2499

p =

1.2500

p =

1.2500

p =

1.2500

p =

1.2500

Final Example and application also

```
function y=f(x)                a=1; b=2; n=18  
% the integration of  
y=12*x^2+sqrt(cos(x))+exp(x)/log(x)+15;
```

p =

0.5000

p =

1.2500

p =

1.6250

p =

1.8125

p =

1.9063

p =

1.9531

p =

1.9766

p =

1.9883

p =

1.9941

p =

1.9971

p =

1.9985

p =

1.9993

p =

1.9996

p =

1.9998

p =

1.9999

p =

2.0000

p =

2.0000

p =

2.0000

Please write the program of the next class.
The Newton Algorithm before come to class.

Note the student haven't
bring the program in M-file
he will get *Lapse*.

Date March,28 2006