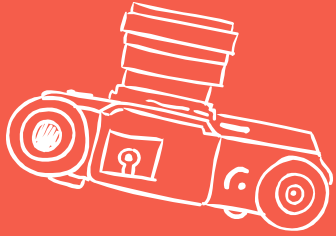
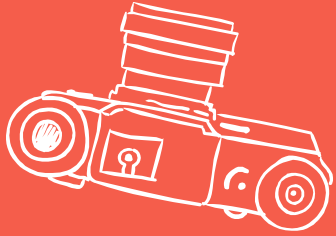


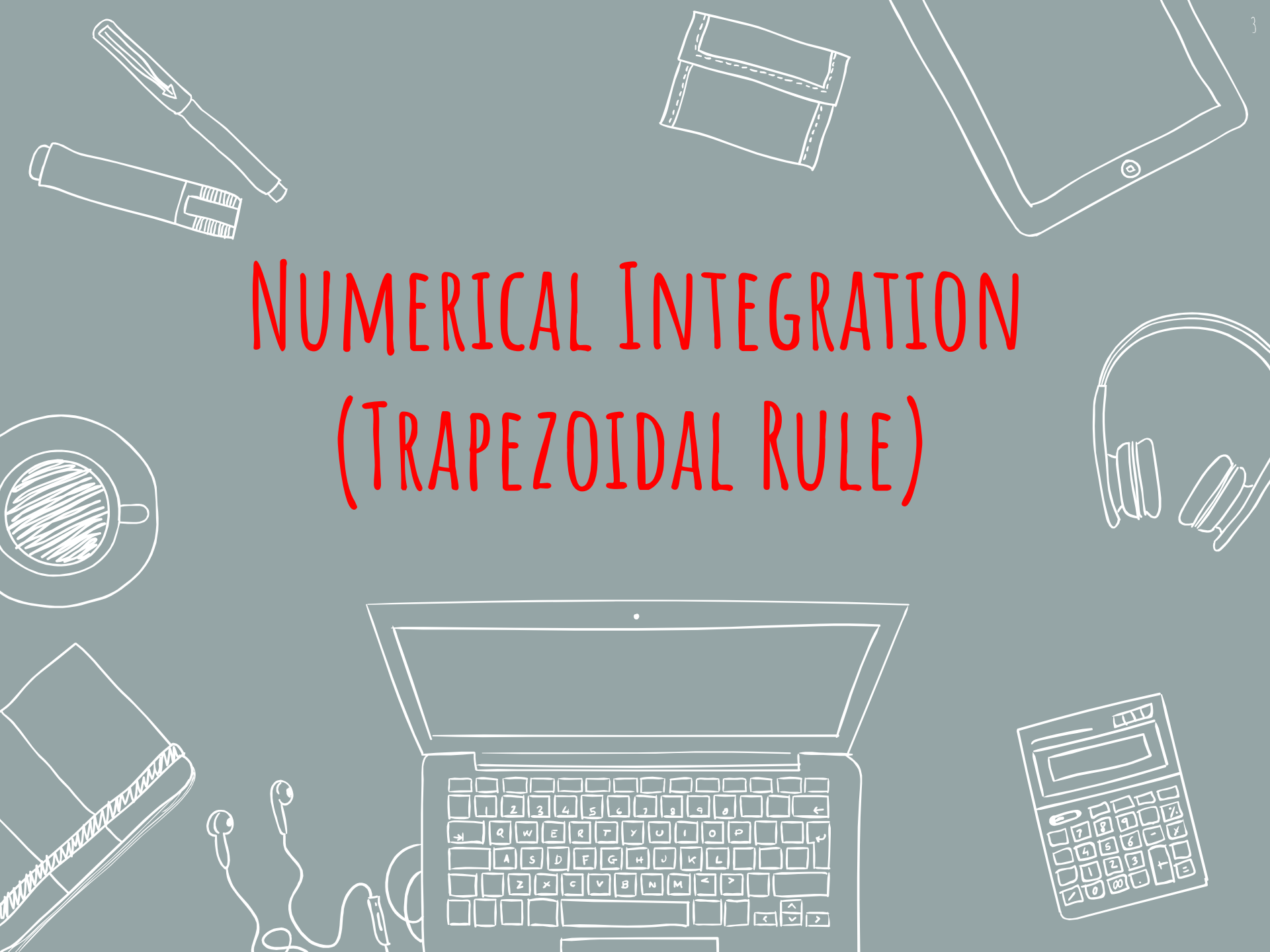
WELCOME



MY PRESENTATION TOPIC IS



NUMERICAL INTEGRATION (TRAPEZOIDAL RULE)





SUBMITTED TO:

Ayesha Siddika

Assistant Professor,

City University

Department of CSE



Submitted By

Name: Abidur Rahman

ID: 142362004

Batch: 36th

Department: CSE



Introduction

Numerical integration is used to obtain approximate answers for definite integrals that cannot be solved analytically.

Numerical integration is a process of finding the numerical value of a definite integral

$$I = \int_a^b f(x) dx,$$

When a function $y=f(x)$ is not known explicitly. But we give only a set of values of the function $y=f(x)$ corresponding to the same values of x .



WHAT IS TRAPEZOIDAL METHOD?

In numerical analysis, the trapezoidal rule or method is a technique for approximating the definite integral

$$\int_a^b f(x) \, dx$$

It also known as Trapezium rule.



GENERAL FORMULA OF INTEGRATION

In general integration formula of Trapezoidal Rule.

$$I_1 = \frac{h}{2} (y_0 + y_1)$$

$$I_2 = \frac{h}{2} (y_1 + y_2)$$

$$I_3 = \frac{h}{2} (y_2 + y_3)$$

$$I_n = \frac{h}{2} (y_{n-1} + y_n)$$

$$I = I_1 + I_2 + I_3 + I_n$$

Trapezoidal Rule is,

$$I = \frac{h}{2} [y_0 + y_n] + 2(y_1 + y_2 + y_3 + \cdots + y_{n-1})$$

HISTORY OF TRAPEZOIDAL METHOD

Trapezoidal Rule," by Nick Trefethen and André Weideman. It deals with a fundamental and classical issue in numerical analysis—approximating an integral.



Trefethen

By focusing on up-to-date convergence of recent results



ADVANTAGES

There are many alternatives to the trapezoidal rule, but this method deserves attention because of

- ❖ Its ease of use
- ❖ Powerful convergence properties
- ❖ Straightforward analysis

APPLICATION OF TRAPEZOIDAL RULE

- ❖ The trapezoidal rule is one of the family members of numerical-integration formula.
- ❖ The trapezoidal rule has faster convergence.
- ❖ Moreover, the trapezoidal rule tends to become extremely accurate than periodic functions.

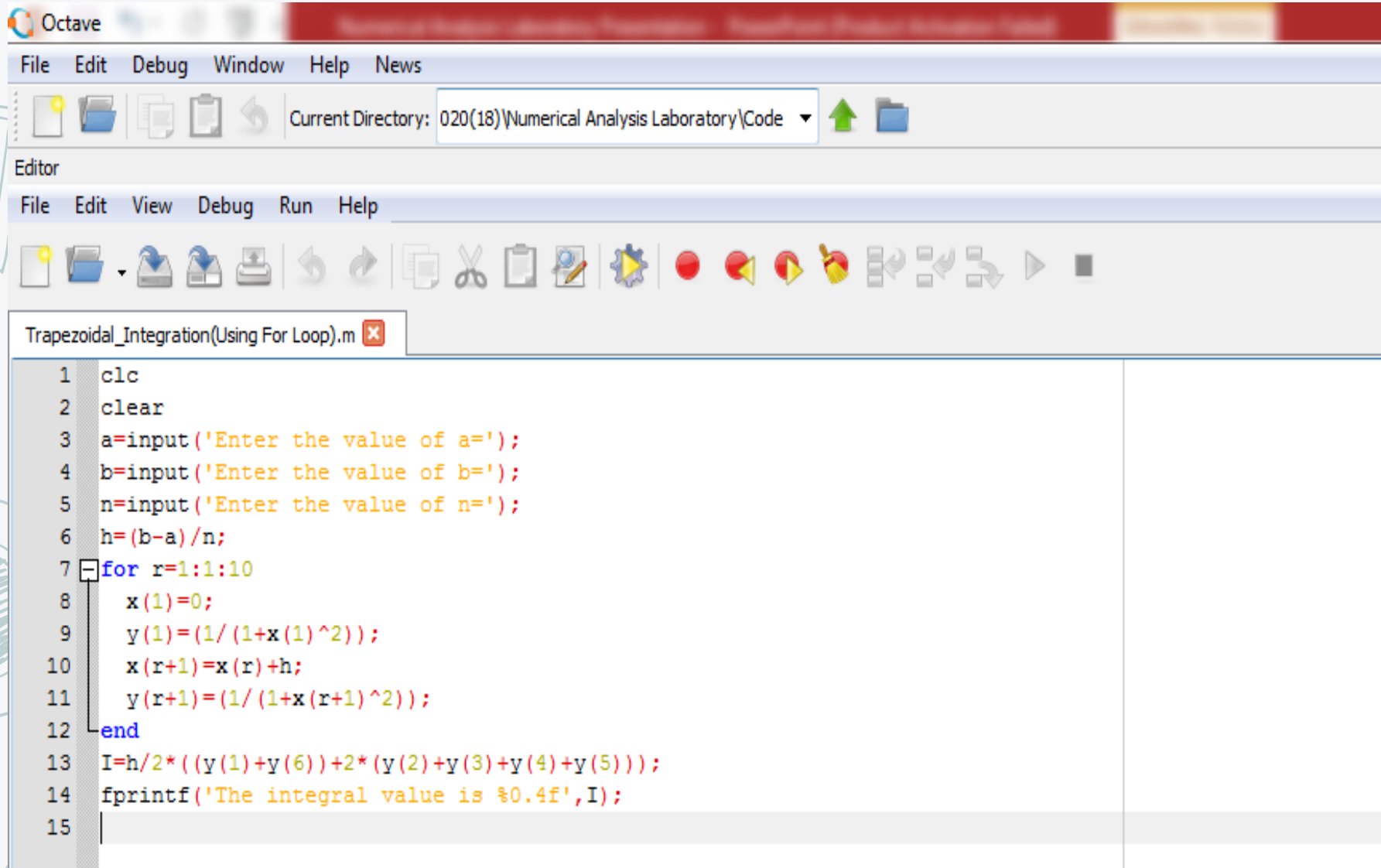
CODE FOR TRAPEZOIDAL METHOD

Problem: Find the value of $\int_0^1 \frac{dx}{1+x^2}$, taking 5 subinterval by Trapezoidal rule, correct to five significant figures. Also compare it with its exact value.

Solution:

```
clc
clear
a=input('Enter the value of a=');
b=input('Enter the value of b=');
n=input('Enter the value of n=');
h=(b-a)/n;
for r=1:1:10
    x(1)=0;
    y(1)=(1/(1+x(1)^2));
    x(r+1)=x(r)+h;
    y(r+1)=(1/(1+x(r+1)^2));
end
I=h/2*((y(1)+y(6))+2*(y(2)+y(3)+y(4)+y(5)));
fprintf('The integral value is %0.4f',I);
```

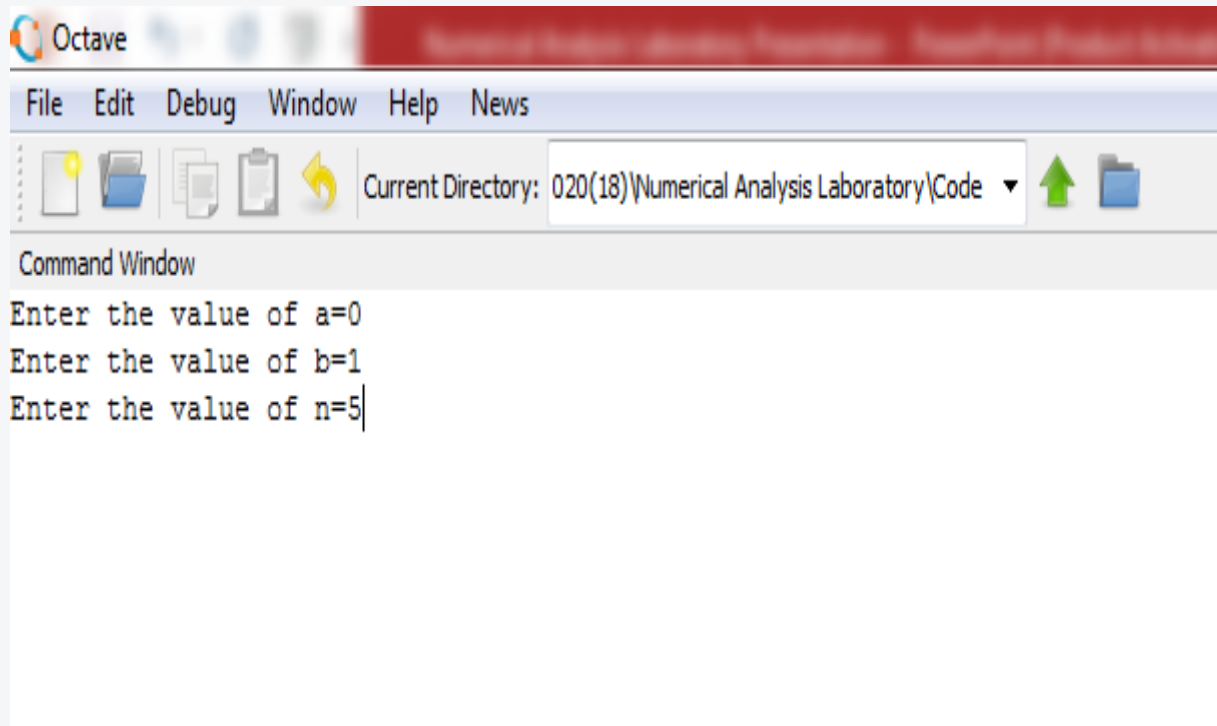
CODE USING OCTAVE



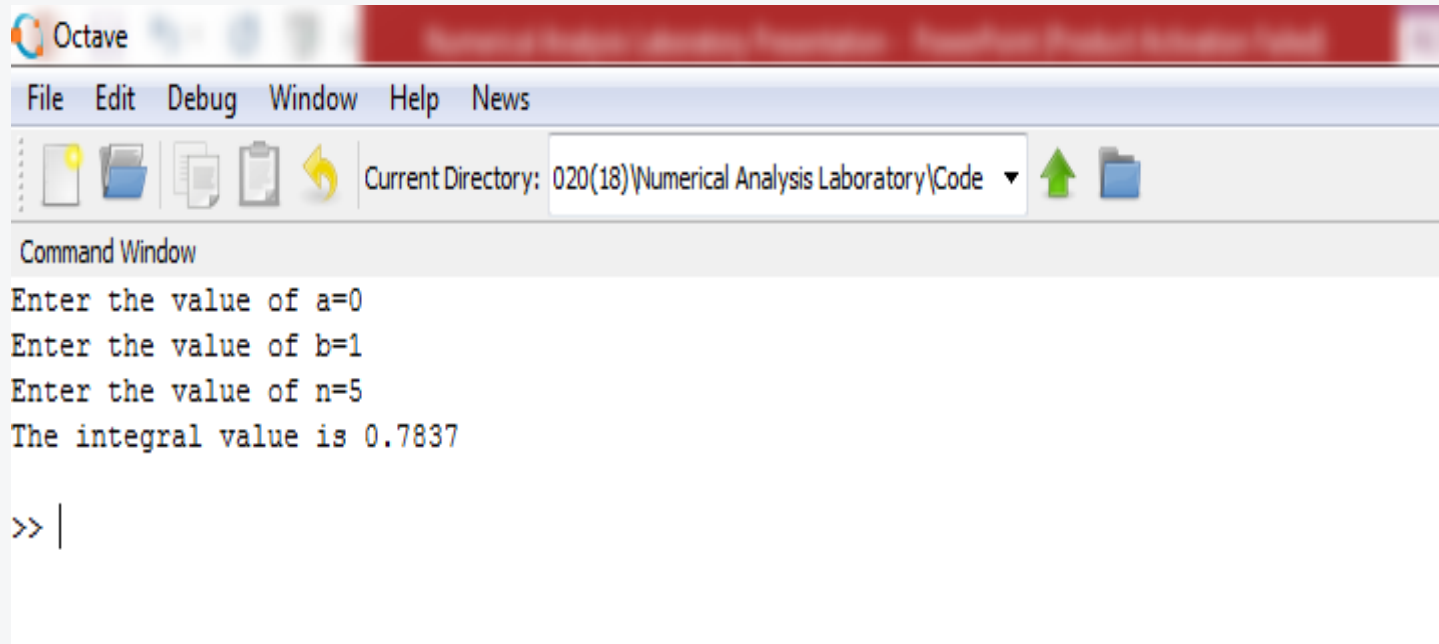
The screenshot displays the Octave software environment. The main window has a menu bar with 'File', 'Edit', 'Debug', 'Window', 'Help', and 'News'. Below the menu bar is a toolbar with icons for file operations and execution. The 'Current Directory' is set to '020(18)\Numerical Analysis Laboratory\Code'. The editor window is titled 'Trapezoidal_Integration(Using For Loop).m' and contains the following MATLAB code:

```
1 clc
2 clear
3 a=input('Enter the value of a=');
4 b=input('Enter the value of b=');
5 n=input('Enter the value of n=');
6 h=(b-a)/n;
7 for r=1:1:10
8     x(1)=0;
9     y(1)=(1/(1+x(1)^2));
10    x(r+1)=x(r)+h;
11    y(r+1)=(1/(1+x(r+1)^2));
12 end
13 I=h/2*((y(1)+y(6))+2*(y(2)+y(3)+y(4)+y(5)));
14 fprintf('The integral value is %0.4f',I);
15
```

INPUT THE VALUE



INPUT & OUTPUT VALUE

A screenshot of the Octave software interface. The title bar says 'Octave'. The menu bar includes 'File', 'Edit', 'Debug', 'Window', 'Help', and 'News'. The toolbar shows icons for file operations and a 'Current Directory' dropdown set to '020(18)\Numerical Analysis Laboratory\Code'. The Command Window displays the following text:

```
Enter the value of a=0  
Enter the value of b=1  
Enter the value of n=5  
The integral value is 0.7837  
  
>> |
```

Octave

File Edit Debug Window Help News

Current Directory: 020(18)\Numerical Analysis Laboratory\Code

Command Window

Enter the value of a=0
Enter the value of b=1
Enter the value of n=5
The integral value is 0.7837

>> |

CONCLUSION

Trapezoidal Method can be applied accurately for non periodic function, also in terms of periodic integrals.

when periodic functions are integrated over their periods, trapezoidal looks for extremely accurate.



REFERENCES

- ❖ http://en.wikipedia.org/wiki/Trapezoidal_rule
- ❖ <http://blogs.siam.org/the-mathematics-andhistory-of-the-trapezoidal-rule/>
- ❖ And various relevant websites



Thanks!

To All

