# Welcome

# My Presentation Topic Is

# Numerical Integration (Trapezoidal Rule)

SUBMITTED TO:

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# 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

$$\int_a^b f(x)\,\mathrm{dx}$$

It also known as Trapezium rule.

# General Formula of integration

In general integration formula of Trapezoidal Rule.

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

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

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

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

$$\mathrm{I} = I_1 + I_2 + I_3 + I_n$$

Trapezoidal Rule is,

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

# 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 covergence 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.

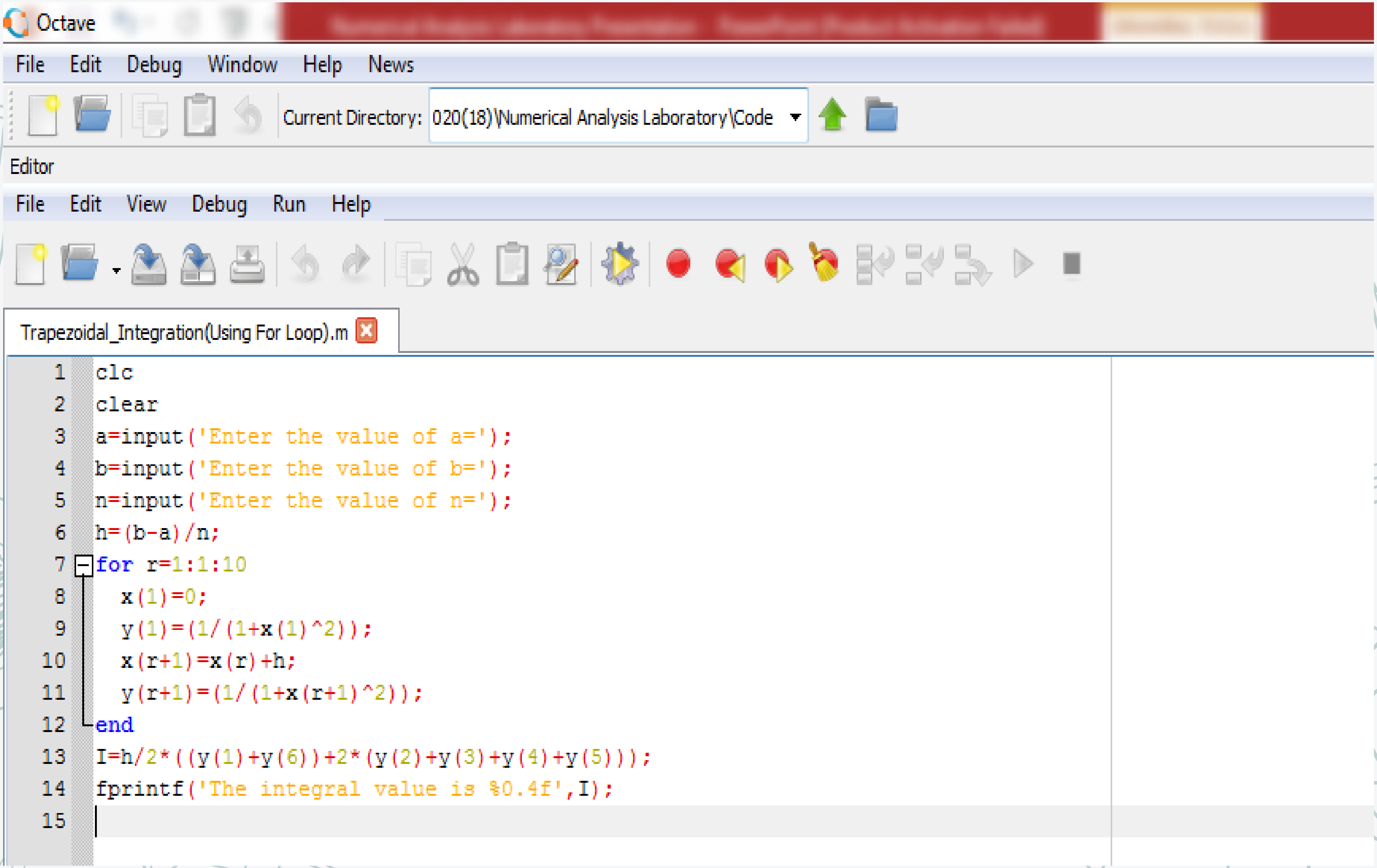
# Code for Trapezoidal Method

*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.*

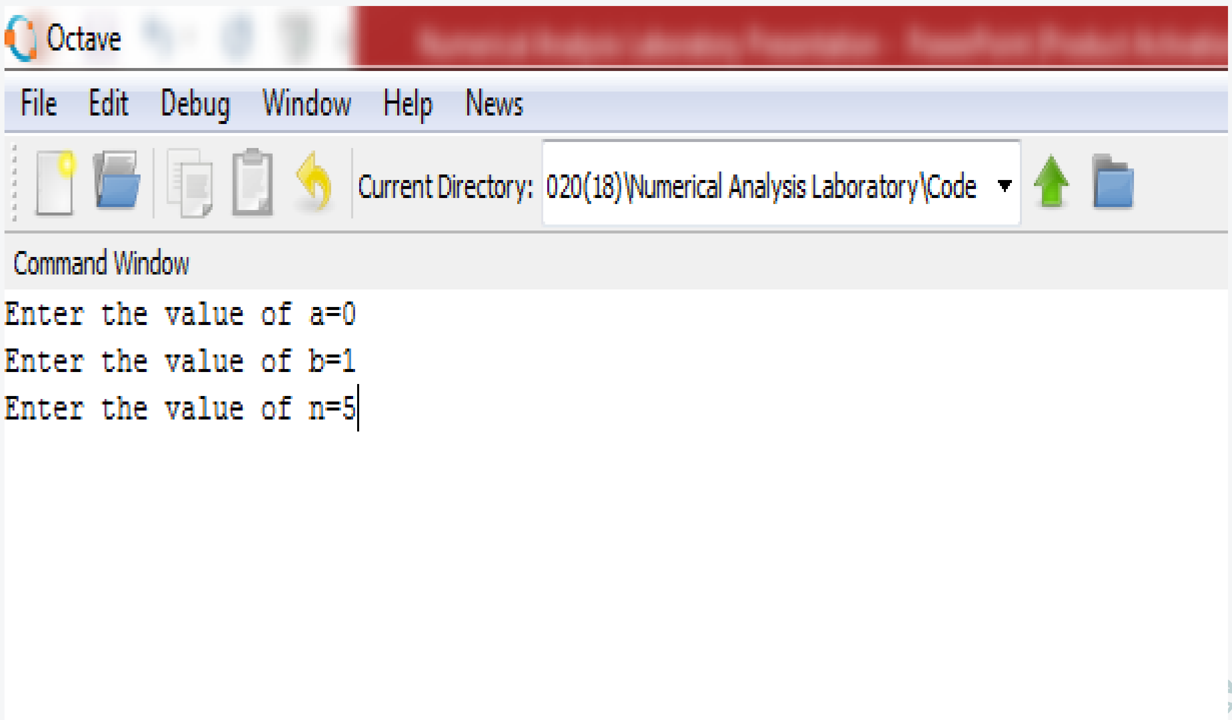
*Solution:*

```
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);
```

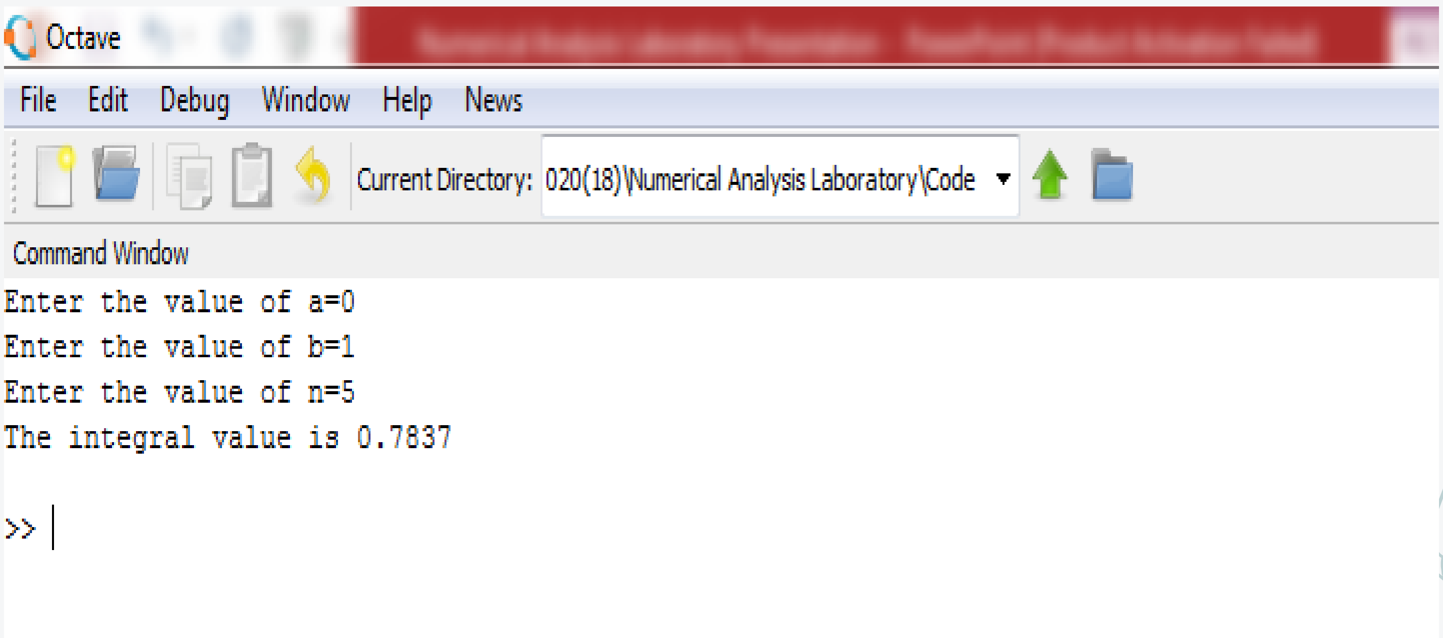
# Code using Octave



# INPUT THE VALUE



# Input & Output value



# 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