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**Title:** Reimann sums and area of region formed by close curves

**Aim:** To evaluate the definite integrals, Riemann sums and compare it and to find the area of the regions enclosed by curves and visualize it.

**Questions**

1. Evaluate the definite integrals, Riemann sums and compare the function  $f(x) = \sin(x)$ ,  $0 < x < 2\pi$ .
2. Evaluate the definite integrals, Riemann sums and compare the function  $f(x) = |x + 1|$ ,  $-5 < x < 5$ .
3. Find the area of the regions enclosed by the curves  $y = x^2 - 2x$ ,  $y = x$
4. Find the area of the regions enclosed by the curves  $y = x^4 - 4x^2 + 4$ ,  $y = x^2$
5. Find the area of the regions enclosed by the curves  $y = -x^2 + 4x$ ,  $y = x^2$
6. Find the area of the regions enclosed by the curves  $y = 7 - 2x^2$ ,  $y = x^2 + 4$

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**Code 1 – for Questions 1 and Question 2**

%To evaluate the definite integrals, Riemann sums and compares it.

clc

clear all

format compact

syms x

f=input('Enter the function f(x): ')

a=input('Enter the lower limit x: ')

b=input('Enter the upper limit of x: ')

n=input('Number of intervals')

```

value = 0
dx = (b-a)/n
for k=1:n
    c = a+k*dx
    d = subs(f,x,c)
    value = value +d
end
value = dx*value
ezplot(f,[a b])
z=int(f,a,b)
rsums(f,a,b)

```

### **Question-1**

#### **Output:**

Enter the function f(x):

sin(x)

f =

sin(x)

Enter the lower limit x:

0

a =

0

Enter the upper limit of x:

2\*pi

b =

6.2832

Number of intervals

7

n =

7

value =

0

dx =

0.8976

c =

0.8976

d =

$\sin((2\pi)/7)$

value =

$\sin((2\pi)/7)$

c =

1.7952

d =

$\sin((3\pi)/7)$

value =

$\sin((2\pi)/7) + \sin((3\pi)/7)$

c =

2.6928

d =

$\sin(\pi/7)$

value =

$\sin(\pi/7) + \sin((2\pi)/7) + \sin((3\pi)/7)$

c =

3.5904

d =

$-\sin(\pi/7)$

value =

$\sin((2\pi)/7) + \sin((3\pi)/7)$

c =

4.4880

d =

$-\sin((3\pi)/7)$

value =

$\sin((2\pi)/7)$

c =

5.3856

d =

$-\sin((2\pi)/7)$

value =

0

c =

6.2832

d =

0

value =

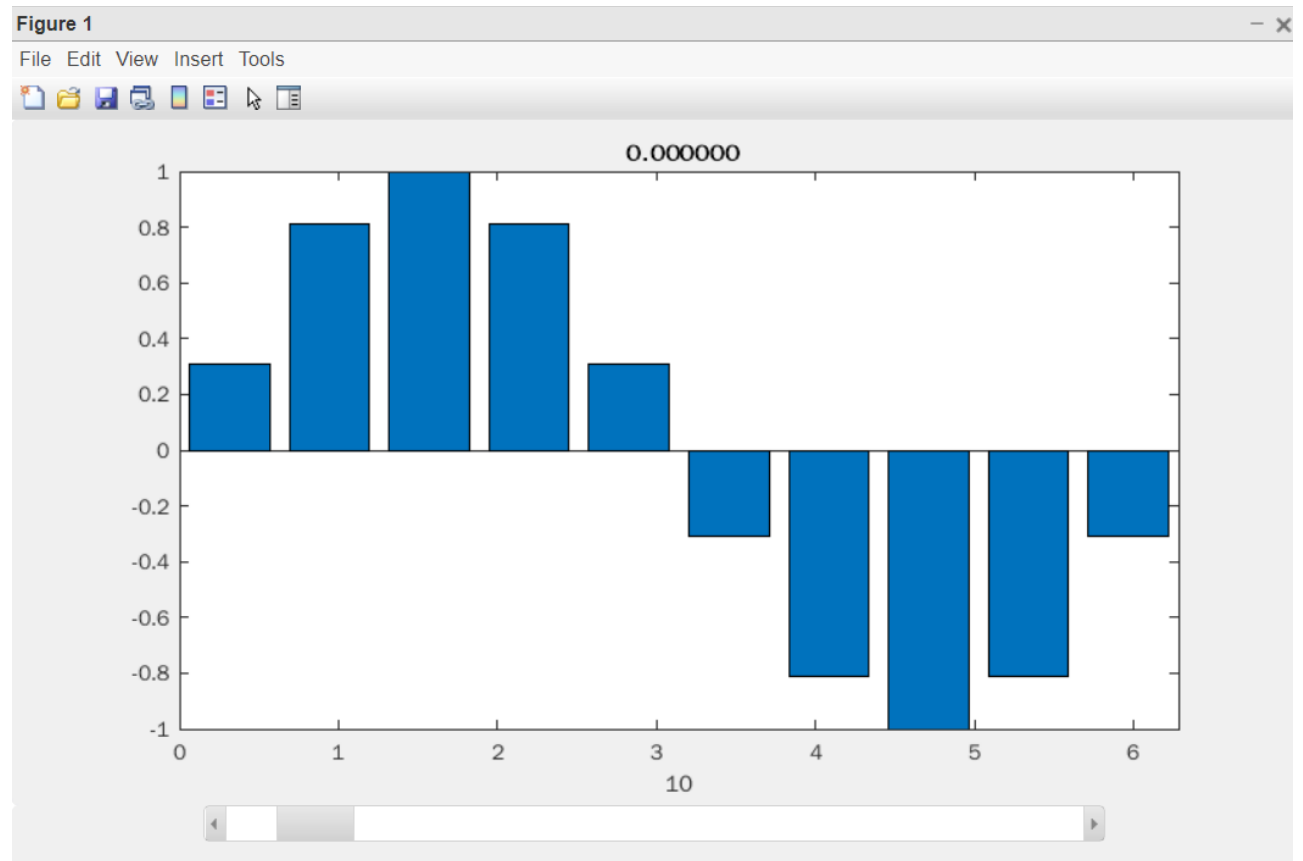
0

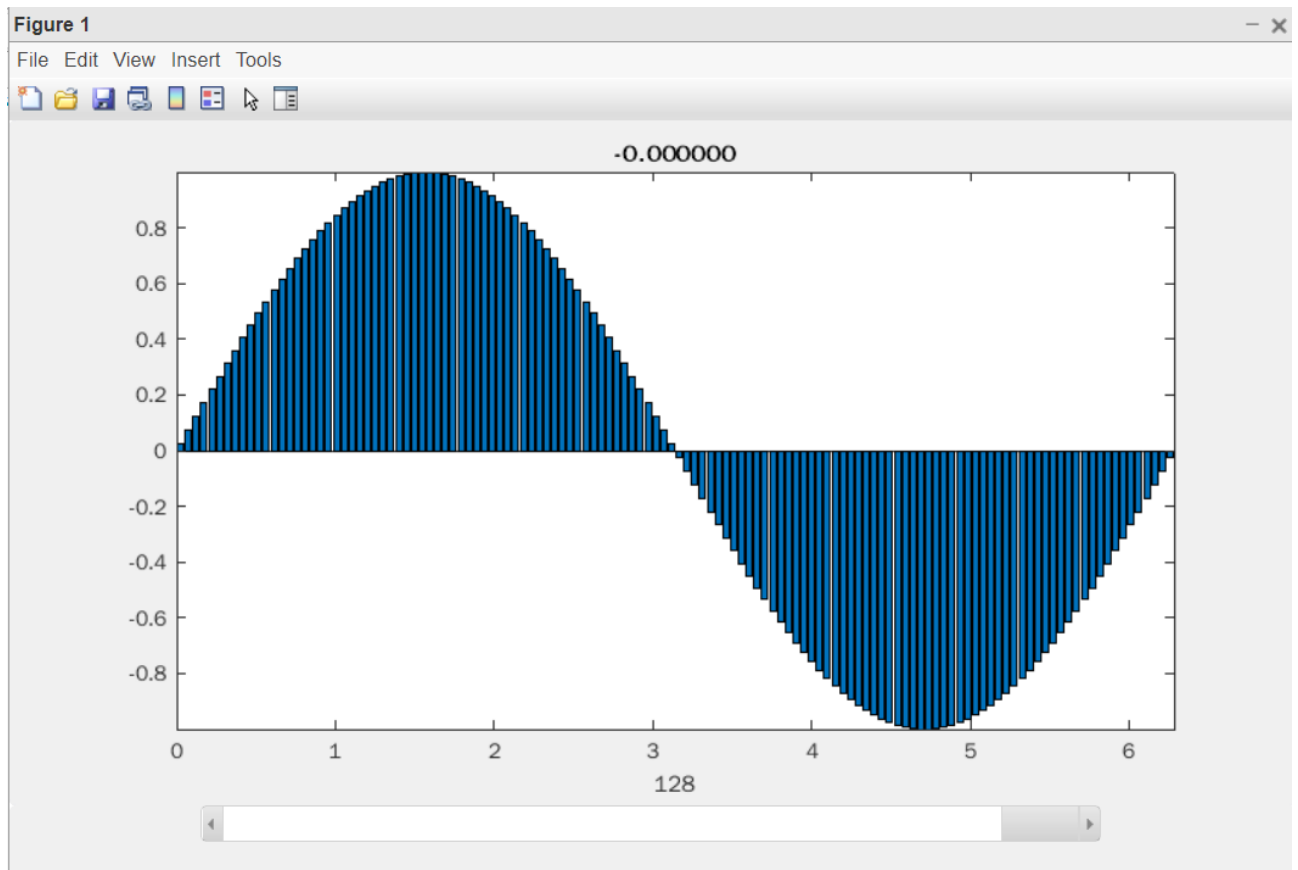
value =

0

z =

0





## Question-2

### **Output:**

Enter the function  $f(x)$ :

$\text{abs}(x+1)$

$f =$

$\text{abs}(x + 1)$

Enter the lower limit  $x$ :

-5

$a =$

-5

Enter the upper limit of  $x$ :

5

$b =$

5

Number of intervals

7

n =

7

value =

0

dx =

1.4286

c =

-3.5714

d =

18/7

value =

18/7

c =

-2.1429

d =

8/7

value =

26/7

c =

-0.7143

d =

2/7

value =

4

c =

0.7143

d =

12/7

value =

40/7

c =

2.1429

d =

22/7

value =

$62/7$

c =

3.5714

d =

$32/7$

value =

$94/7$

c =

5

d =

6

value =

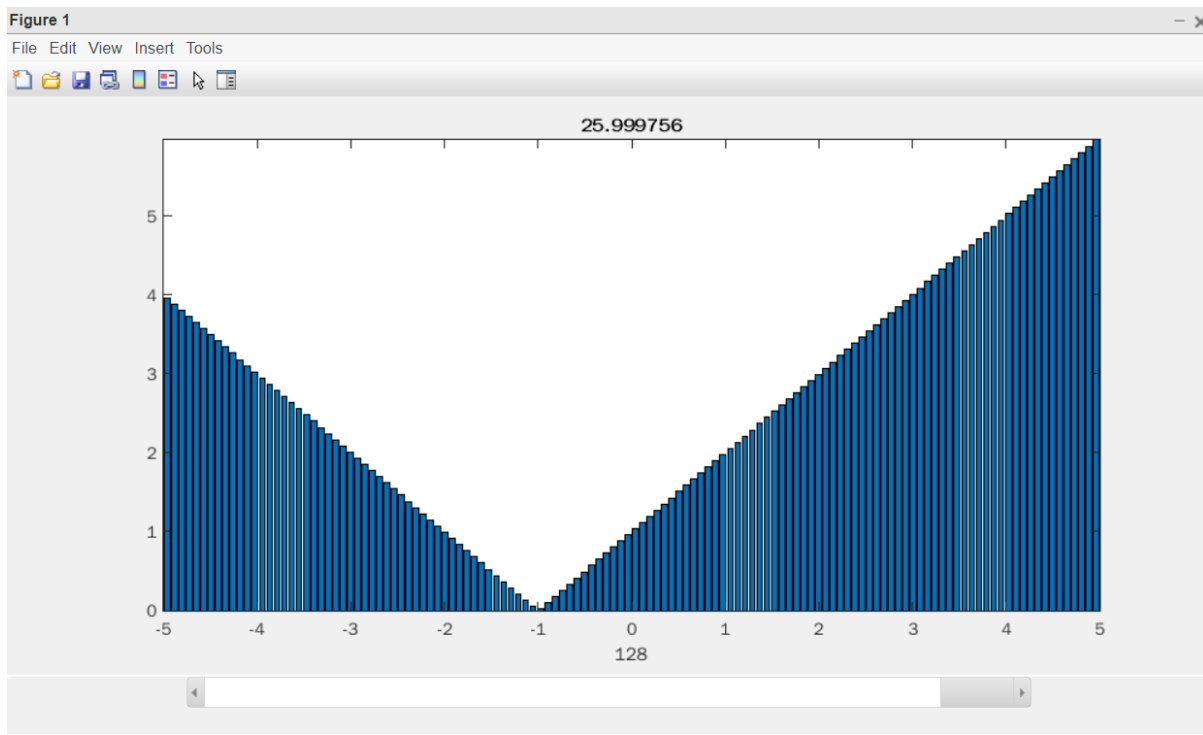
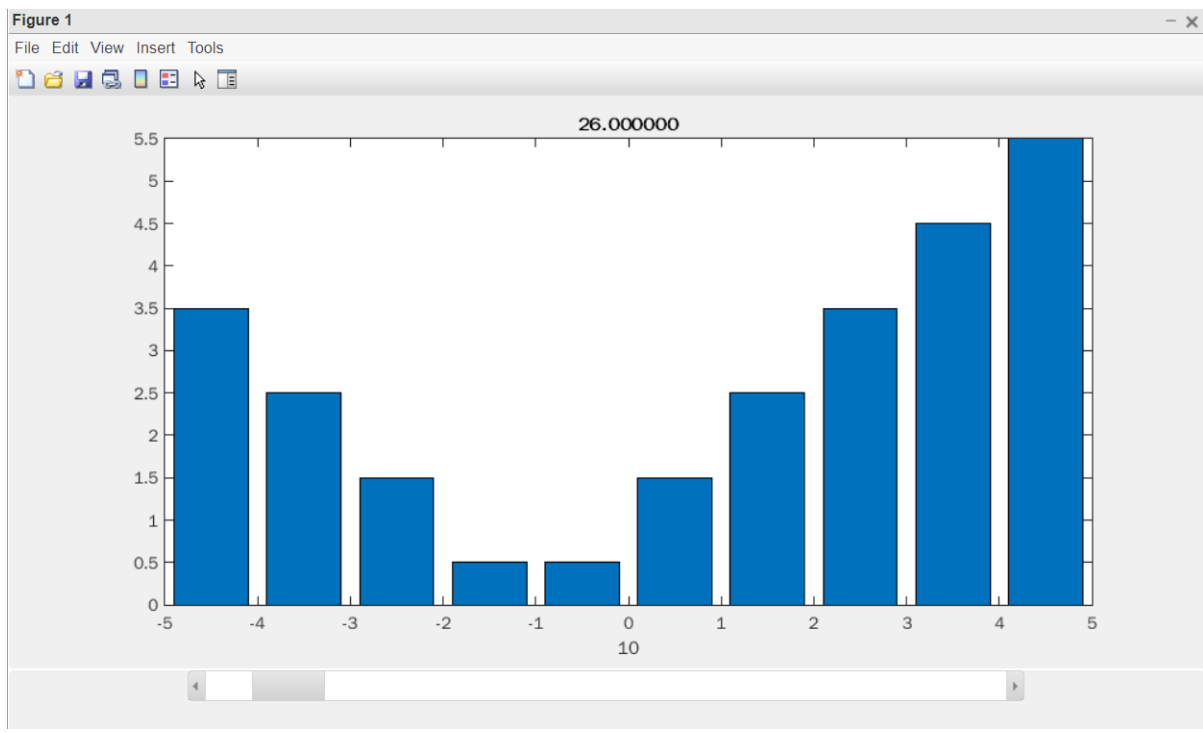
$136/7$

value =

$1360/49$

z =

26





## CODE 2 – Question 3 to Question 6

%To find the area of the regions enclosed by curves and  
%visualize it.

clc

clear all

format compact

syms x y real

y1=input('Enter the first(f) curve: ')

y2=input('Enter the second(g) curve: ')

fg=figure;

ax=axes;

t=solve(y1-y2)

TVALUES=double(t)

n=length(TVALUES)

m1=min(TVALUES)

m2=max(TVALUES)

ez1=ezplot(y1,[m1-1,m2+1])

hold on

TA=0;

ez2=ezplot(y2,[m1-1,m2+1])

if n>2

for i=1:n-1

A = int(y1-y2,t(i),t(i+1))

TA = TA+abs(A)

x1 = linspace(TVALUES(i),TVALUES(i+1))

yy1= subs(y1,x,x1)

yy2= subs(y2,x,x1)

x1 = [x1,flipr(x1)]

yy = [yy1,flipr(yy2)]

fill(x1,yy,'g')

grid on

end

else

```

A = int(y1-y2,t(1),t(2))
TA = abs(A)
x1 = linspace(TVALUES(1),TVALUES(2))
yy1= subs(y1,x,x1)
yy2= subs(y2,x,x1)
x1 = [x1,flip1r(x1)]
yy = [yy1,flip1r(yy2)]
fill(x1,yy,'g')

```

end

### **Question-3**

#### **Output:**

Enter the first(f) curve:

$x^2-2*x$

y1 =

$x^2 - 2*x$

Enter the second(g) curve:

x

y2 =

x

t =

0

3

TVALUES =

0

3

n =

2

m1 =

0

m2 =

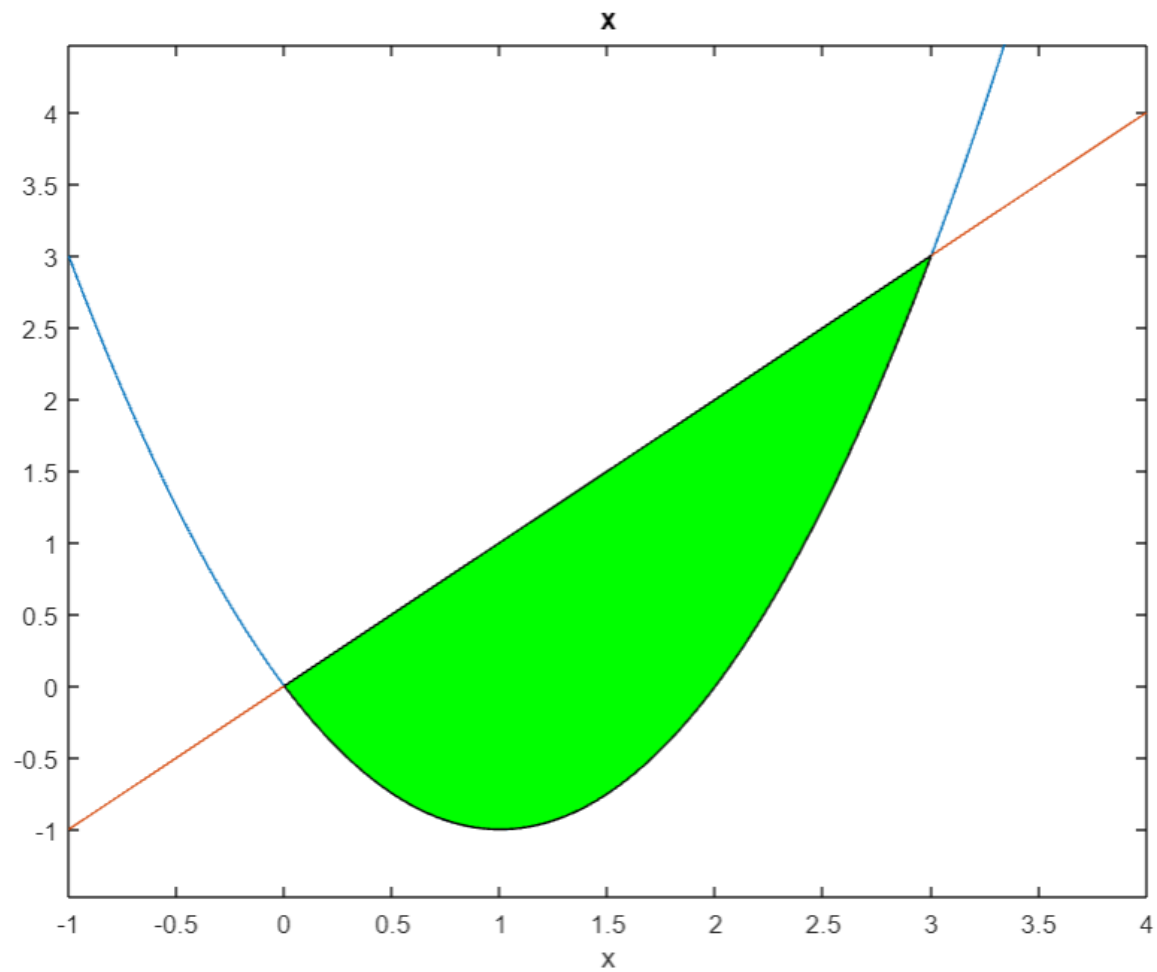
3

A =

-9/2

TA =

9/2



#### QUESTION-4

Output:

Enter the first(f) curve:

$x^4 - 4x^2 + 4$

y1 =

$x^4 - 4x^2 + 4$

Enter the second(g) curve:

$x^2$

y2 =

$x^2$

t =

-2

-1

1

2

TVALUES =

-2

-1

1

2

n =

4

m1 =

-2

m2 =

2

A =

-22/15

TA =

22/15

A =

76/15

TA =

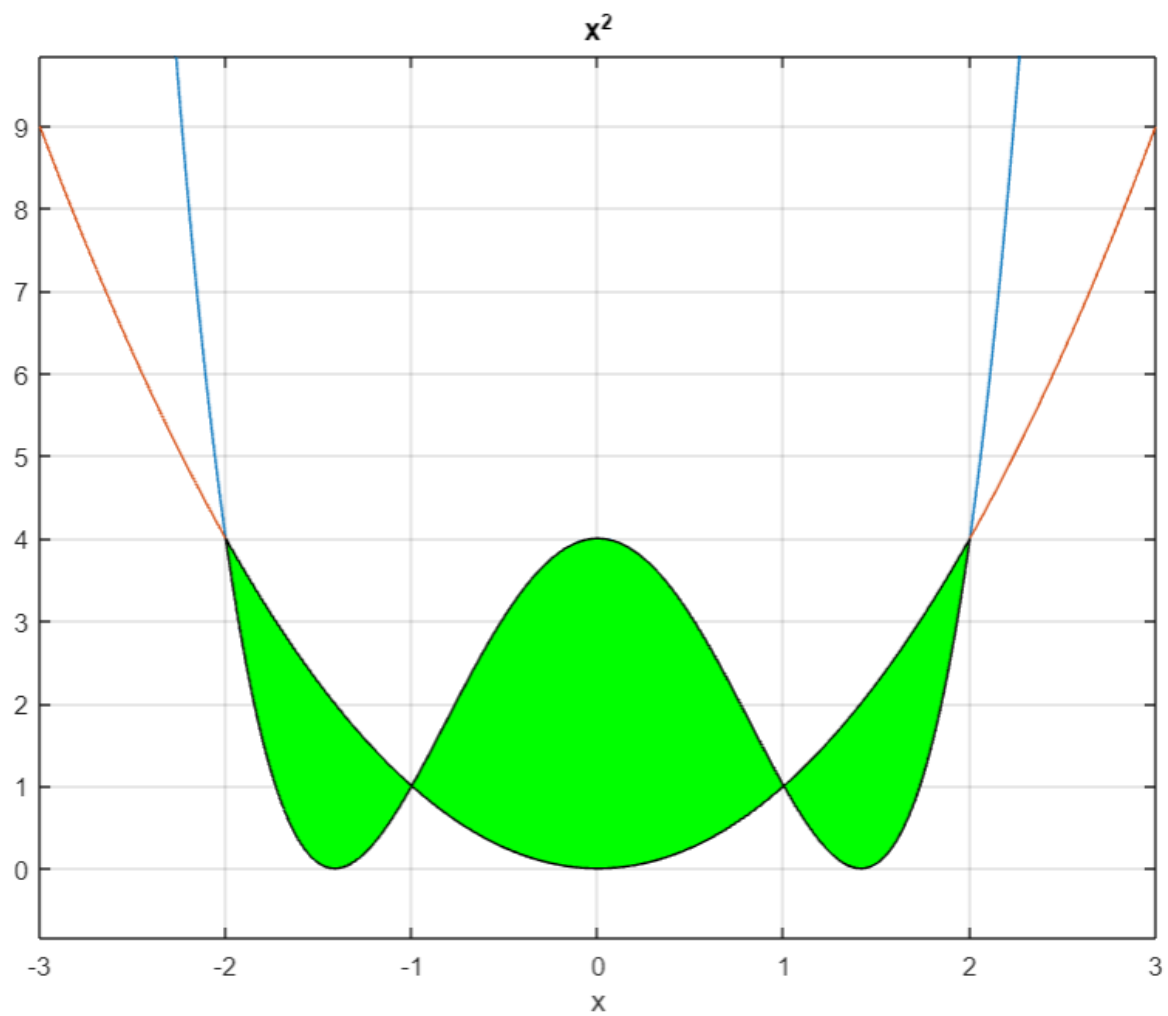
98/15

A =

-22/15

TA =

8



### QUESTION-5

#### **Output:**

Enter the first(f) curve:

$-x^2 + 4x$

y1 =

$-x^2 + 4x$

Enter the second(g) curve:

$x^2$

y2 =

$x^2$

t =

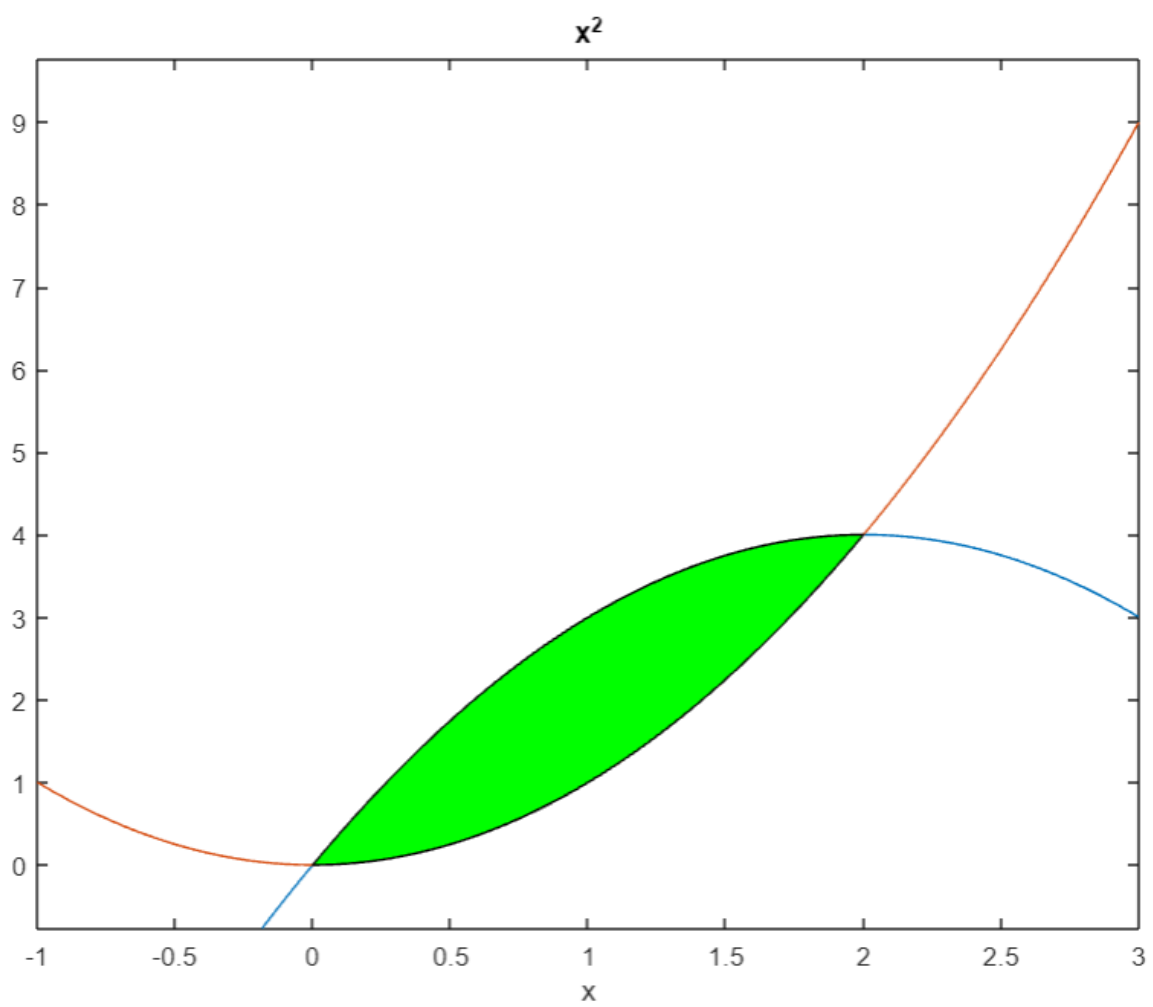
0

2

TVALUES =

0

2  
n =  
2  
m1 =  
0  
m2 =  
2  
A =  
8/3  
TA =  
8/3



## QUESTION-6

### **Output:**

Enter the first(f) curve:

$$7-2*x^2$$

$$y1 =$$

$$7 - 2*x^2$$

Enter the second(g) curve:

$$x^2+4$$

$$y2 =$$

$$x^2 + 4$$

$$t =$$

$$-1$$

$$1$$

$$TVALUES =$$

$$-1$$

$$1$$

$$n =$$

$$2$$

$$m1 =$$

$$-1$$

$$m2 =$$

$$1$$

$$A =$$

$$4$$

$$TA =$$

$$4$$

