

# MATLAB-EXPERIMENT 4B

### TRIPLE INTEGRALS



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#### **Department of Mathematics**

School of Advanced Sciences

MAT 1011 – Calculus for Engineers (MATLAB)

**Experiment 4-B** 

TRIPLE INTEGRALS

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### **Question 1:**

Find the volume of the region bounded between the planes x + y + 2z = 2 and 2x + 2y + z = 4 in the first octant.

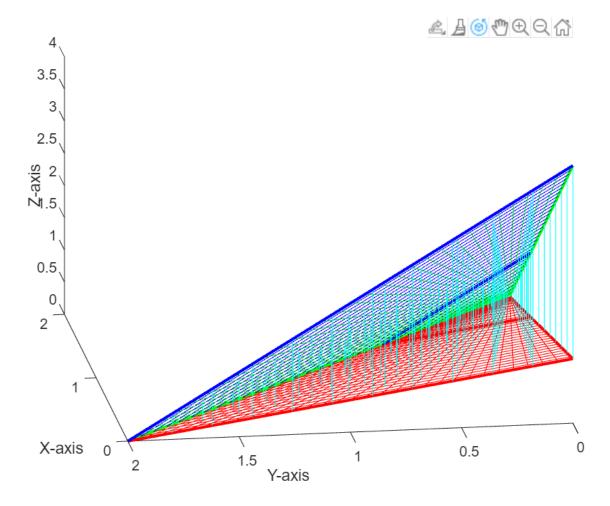
### **CODES:**

```
close all;
clear;
clc;
% to find triple integral over a region
syms x y z;
%specifying the limit of integrals wrt x,y,z
lower_x = 0;
upper x = 2;
```

```
lower y = 0 + 0 * x;
upper_y = 2 - x;
lower_z = (2 - x - y)/2;
upper_z = 2*(2 - x - y);
%calculating the triple integral which gives
the volume enclosed
volume = int(int(int(1 + 0*z, z, lower_z,
upper z), y, lower y, upper y),x, lower x,
upper_x);
%displaying the volume enclosed
disp("The volume bounded by x + y + 2z = 2, 2x
+ 2y + z = 2 and first octane is = ");
disp(volume);
%displaying the 3D plot
figure(1)
viewSolidone(z, lower_z, upper_z, y, lower_y,
upper_y, x, lower_x, upper_x);
xlabel("X-axis");
ylabel("Y-axis");
zlabel("Z-axis");
                   OUTPUT:
The volume bounded by x + y + 2z = 2, 2x + 2y +
z = 2 and first octane is =
2
```

```
close all;
 1
                                                                                 clear;
 2
3
        clc;
        % to find triple integral over a region
4
        syms x y z;
 5
6
        %specifying the limit of integrals wrt x,y,z
7
        lower_x = 0;
8
9
        upper_x = 2;
        lower_y = 0 + 0 * x;
10
11
        upper_y = 2 - x;
        lower_z = (2 - x - y)/2;
12
        upper_z = 2*(2 - x - y);
13
14
        %calculating the triple integral which gives the volume enclosed
15
        volume = int(int(int(1 + 0*z, z, lower_z, upper_z), y, lower_y, upper_y
16
17
        %displaying the volume enclosed
18
        disp("The volume bounded by x + y + 2z = 2, 2x + 2y + z = 2 and first o
19
        disp(volume);
20
21
        %displaying the 3D plot
22
        figure(1)
23
        viewSolidone(z, lower_z, upper_z, y, lower_y, upper_y, x, lower_x, uppe
24
        xlabel("X-axis");
25
        ylabel("Y-axis");
26
        zlabel("Z-axis");
27
```

```
The volume bounded by x + y + 2z = 2, 2x + 2y + z = 2 and first octane is = 2 \Rightarrow
```



### **Question 2:**

Find the volume of the region cut from the solid elliptical cylinder  $x^2 + 4y^2 \le 4$  by the xy -plane and the plane z = x + 2.

#### **CODES:**

```
close all;
clear;
clc;
% to find triple integral over a region
syms x y z;

%specifying the limits of integrations
lower_x = -2;
upper_x = 2;
lower_y = - (sqrt(4 - x^2)/2);
upper_y = sqrt(4 - x^2)/2;
lower_z = 0 + 0*x;
upper_z = x + 2;

%calculating the volume enclosed by triple
integration
```

```
volume = int(int(int(1 + 0*z, z, lower_z, upper_z),
y, lower_y, upper_y), x, lower_x, upper_x);

%displaying the volume
disp("The volume bounded by x^2 + 4y^2 <= 4, z = 0
and z = x + 2 is = ");
disp(volume);

%displaying the 3D-Plot of the planes
figure(1)
viewSolidone(z, lower_z, upper_z, y, lower_y,
upper_y, x, lower_x, upper_x);
xlabel("X-axis");
ylabel("Y-axis");
zlabel("Z-axis");</pre>
```

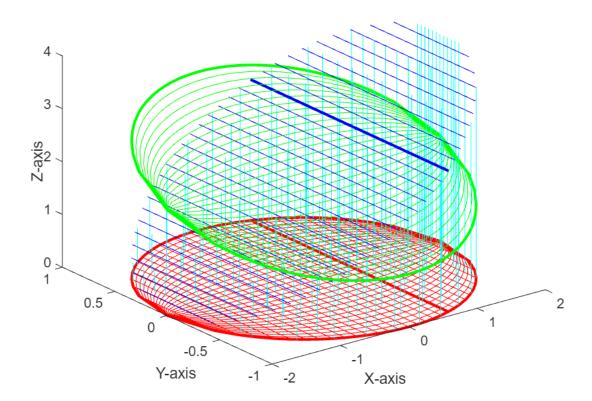
#### **OUTPUT:**

```
The volume bounded by x + y + 2z = 2, 2x + 2y + z = 2 and first octane is = 2
```

>>

```
close all;
1
          clear;
  3
          clc;
          % to find triple integral over a region
  4
  5
          syms x y z;
          %specifying the limits of integrations
         lower_x = -2;
  8
         upper_x = 2;
  9
         lower_y = - (sqrt(4 - x^2)/2);
 10
 11
          upper_y = sqrt(4 - x^2)/2;
         lower_z = 0 + 0*x;
upper_z = x + 2;
 12
 13
 14
          %calculating the volume enclosed by triple integration
          volume = int(int(int(1 + 0*z, z, lower_z, upper_z), y, lower_y, upper_y), x, lower_x, upper_x);
 16
 17
          %displaying the volume
 18
 19
          disp("The volume bounded by x^2 + 4y^2 \le 4, z = 0 and z = x + 2 is = ");
          disp(volume);
 20
          %displaying the 3D-Plot of the planes \,
 23
          figure(1)
          viewSolidone(z, lower_z, upper_z, y, lower_y, upper_y, x, lower_x, upper_x);
 24
          xlabel("X-axis");
ylabel("Y-axis");
 25
 26
          zlabel("Z-axis");
```

```
The volume bounded by x + y + 2z = 2, 2x + 2y + z = 2 and first octane is = 2
```



# **Question 3:**

Calculate the finite region bounded by the planes z = x, x + z = 8, z = y, y = 8and z = 0.

#### **CODES:**

```
close all;
clear;
clc;
% to find triple integral over a region
syms x y z;
%specifying the limits of the integrals
lowerx = z; upperx = 8 - z;
lowery = z; uppery = 8 + 0*z;
lowerz = 0; upperz = 4;
%calculating and displaying the volume enclosed
volume = int(int(int(1 + 0*x, x, lowerx,
upperx), y, lowery, uppery), z, lowerz,
upperz);
disp("The volume bounded by z = x, x + z = 8,
z = y, y = 8 and z = 0 is = ");
disp(volume);
```

```
%visualizing the 3D plot of the planes
figure(1)
viewSolidone(x, lowerx, upperx, y, lowery,
uppery, z,lowerz, upperz);
xlabel("X-axis");
ylabel("Y-axis");
zlabel("Z-axis");
```

## **OUTPUT:**

```
The volume bounded by z = x, x + z = 8, z = y, y = 8 and z = 0 is = 320/3
```

```
close all;
1
                                                                                                                        0
        clear;
2
3
        clc;
        % to find triple integral over a region
4
 5
        syms x y z;
 6
        %specifying the limits of the integrals
7
 8
        lowerx = z; upperx = 8 - z;
        lowery = z; uppery = 8 + 0*z;
9
10
        lowerz = 0 ; upperz = 4;
11
        %calculating and displaying the volume enclosed
        volume = int(int(int(1 + 0*x, x, lowerx, upperx), y, lowery, uppery), z, lowerz, upperz);
13
        disp("The volume bounded by z = x, x + z = 8, z = y, y = 8 and z = 0 is = ");
14
        disp(volume);
15
17
        %visualizing the 3D plot of the planes
        figure(1)
18
19
        \label{eq:viewSolidone} viewSolidone(x, lowerx, upperx, y, lowery, uppery, z, lowerz, upperz);
        xlabel("X-axis");
20
       ylabel("Y-axis");
21
       zlabel("Z-axis");
22
```

COMMAND WINDOW

```
The volume bounded by z=x, x+z=8, z=y, y=8 and z=0 is = 320/3
```

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