MATLAB-EXPERIMENT 4B

TRIPLE INTEGRALS

MARCH 26, 2021
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School of Advanced Sciences

MAT 1011 – Calculus for Engineers (MATLAB)

Experiment 4-B

TRIPLE INTEGRALS

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Registration Number: 20BDS0405

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;
```

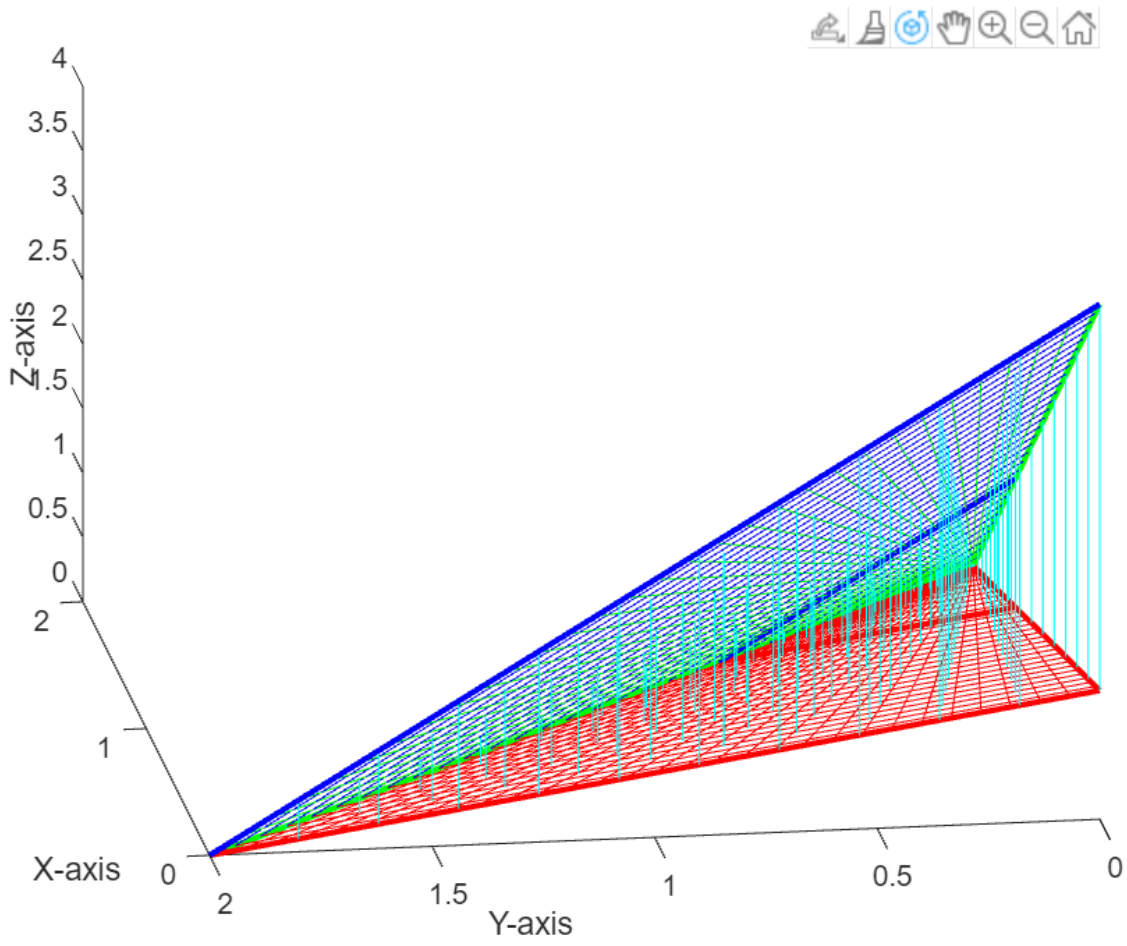
```
lower_y = 0 + 0 * x;
upper_y = 2 - x;
lower_z = (2 - x - y)/2;
upper_z = 2*(2 - x - y);

%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;
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

%displaying the volume enclosed
disp("The volume bounded by x + y + 2z = 2, 2x + 2y + z = 2 and first o
disp(volume);

%displaying the 3D plot
figure(1)
viewSolidone(z, lower_z, upper_z, y, lower_y, upper_y, x, lower_x, uppe
xlabel("X-axis");
ylabel("Y-axis");
zlabel("Z-axis");
```

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

>>
```


4
3.5
3
2.5
2
1.5
1
0.5
0
Z-axis
2
1
0
X-axis
0
2
1.5
1
0.5
0
Y-axis

Question 2:

Find the volume of the region cut from the solid elliptical cylinder $x^2 + 4y^2 \leq 4$ 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");
```

OUTPUT:

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


>>
```

```
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");
```

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


>>
```

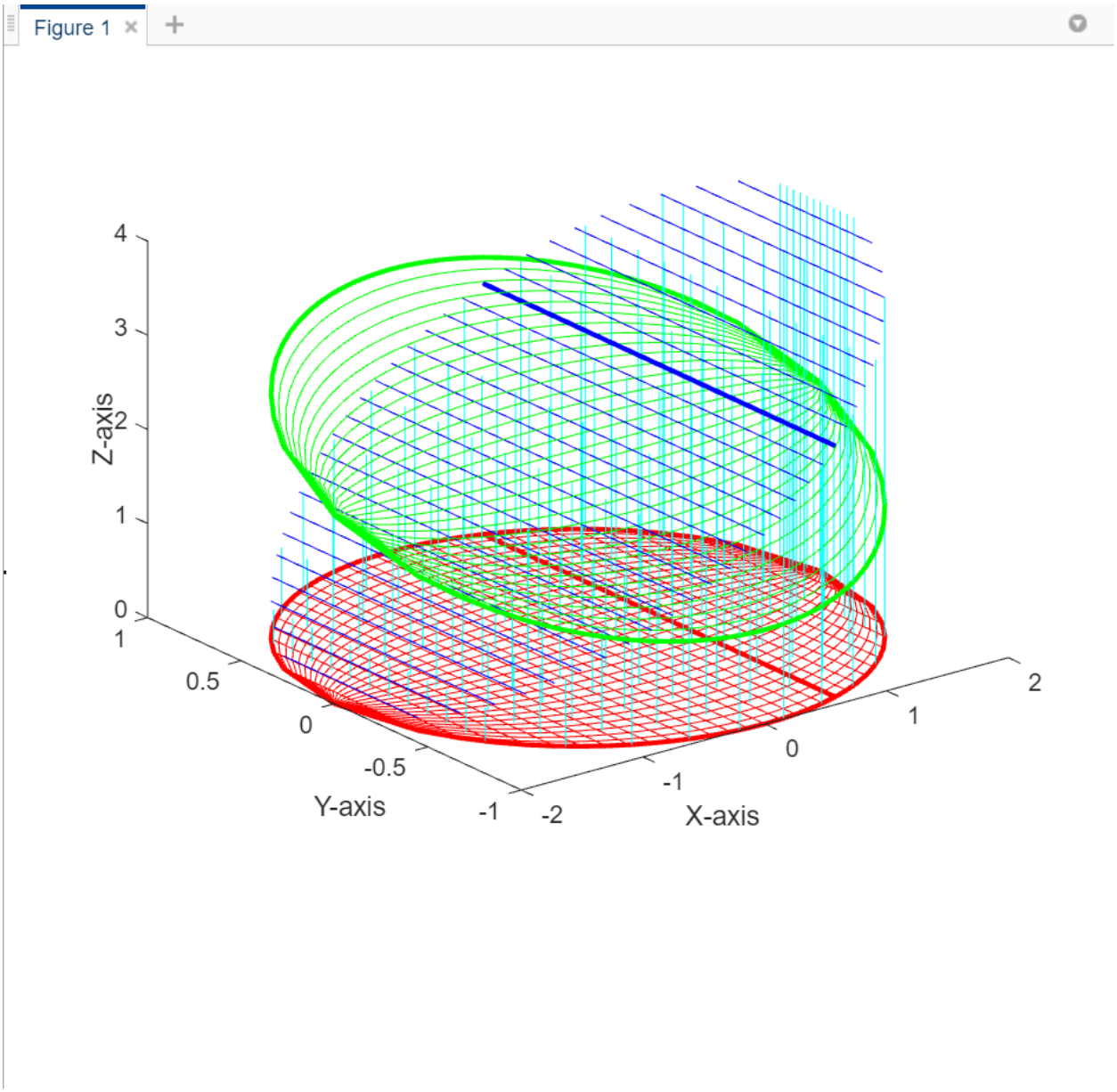


Figure 1
Z-axis
4
3
2
1
0
1
0.5
0
-0.5
-1
Y-axis
-2
-1
0
1
2
X-axis

Question 3:

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

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;
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");
```

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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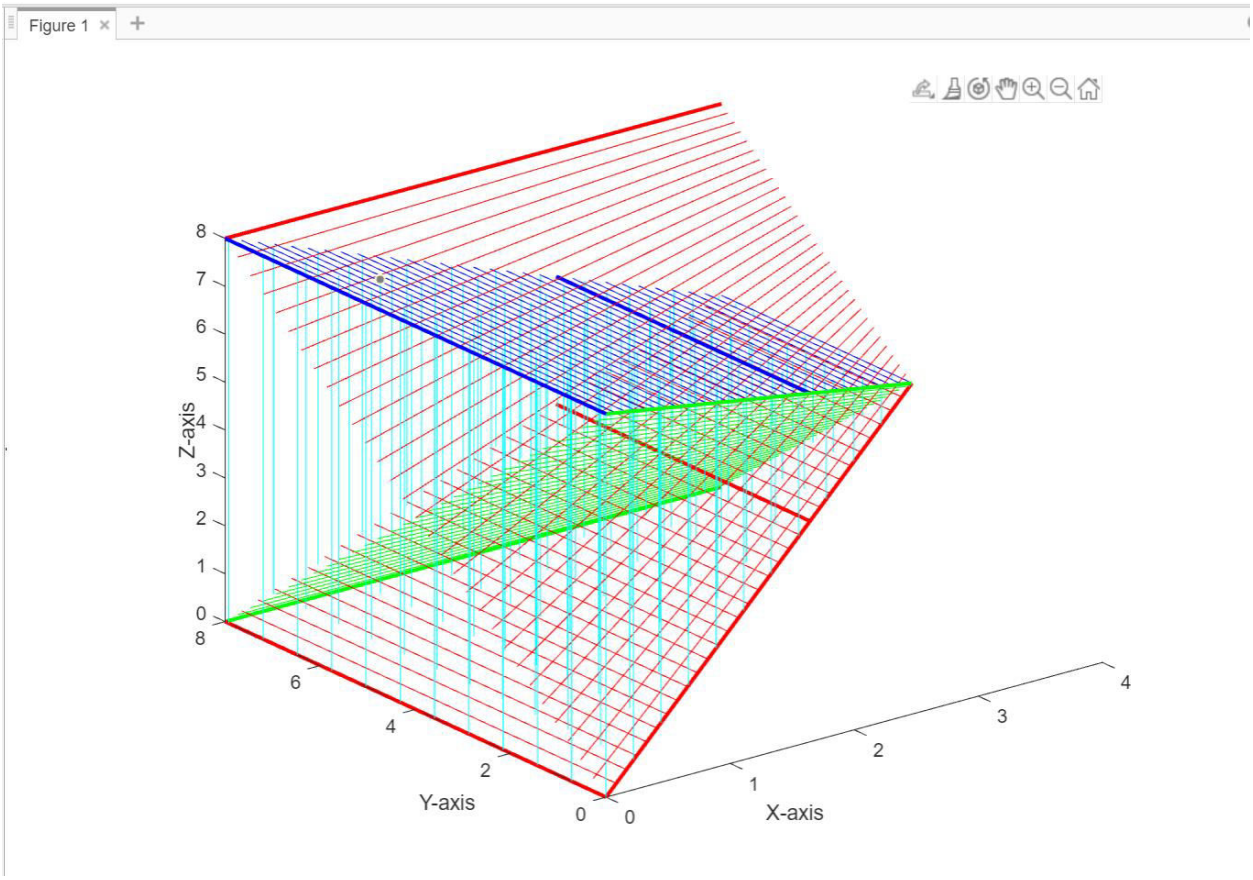
Figure 1
Z-axis
Y-axis
X-axis
0
1
2
3
4
5
6
7
8