Matlab-4

Disk Method

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DISK METHOD

Experiment 4 (01-08-2016)

Aim:

Find the volume of the solid generated by revolving the region bounded by y = sqrt(x) and the lines y = 1, x = 4 about the line y = 1. Visualize this through mathlab.

New Commands:

int(expr,var,a,b): computes the definite integral of expr with respect to var from a to b. If you do not specify var, then int uses the default variable determined by symvar.

B= fliplr(A): returns A with its columns flipped in the left-right direction.

fill(X,Y,C): creates filled polygons from the data in X and Y with vertex color specified by C.

[X,Y,Z] = cylinder(r,n): returns the x-, y-, and z-coordinates of a cylinder based on the profile curve defined by vector r. The cylinder has n equally spaced points around its circumference.

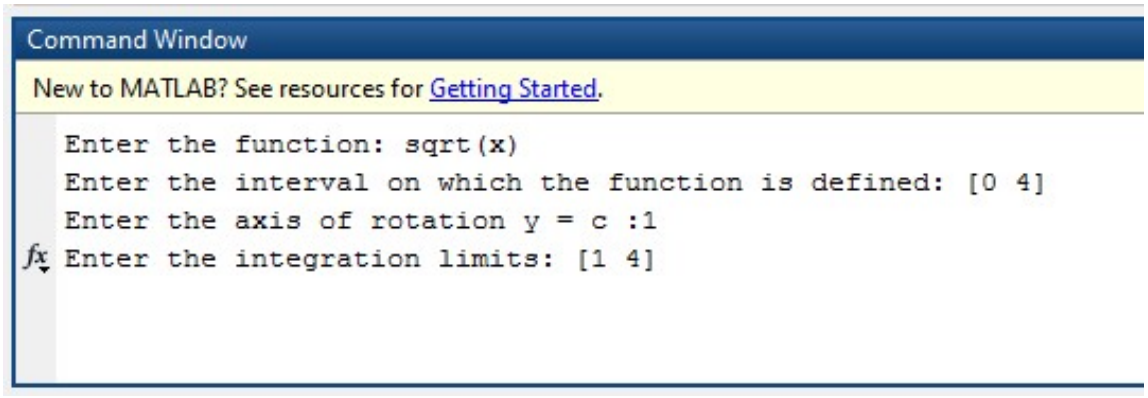
surf(X,Y,Z): creates a three-dimensional shaded surface.

The code:

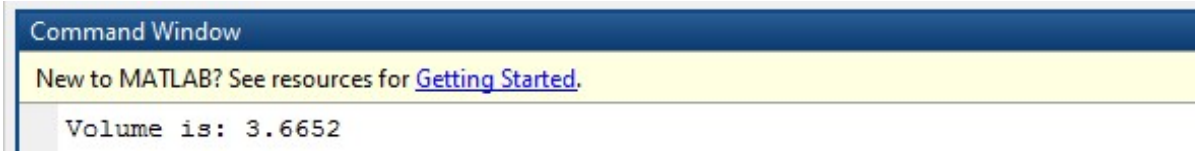
```
clc
clear all
clearvars
syms x;
f = input('Enter the function: ');
fL = input('Enter the interval on which the function is defined: ');
yr = input('Enter the axis of rotation y = c :');
iL = input('Enter the integration limits: ');
Volume = pi*int((f-yr)^2,iL(1),iL(2));
disp(['Volume is: ', num2str(double(Volume))])
fx = inline(vectorize(f));
xvals = linspace(fL(1),fL(2),201);
xvalsr = fliplr(xvals);
xivals = linspace(iL(1),iL(2),201);
xivalsr = fliplr(xivals);
xlim = [fL(1) fL(2)+0.5];
ylim = fx(xlim);
figure('Position',[100 200 560 420])
subplot(2,1,1)
hold on;
plot(xvals,fx(xvals),'-b','LineWidth',2);
plot([fL(1) fL(2)],[yr yr],'-r','LineWidth',2);
legend('Function Plot','Filled Region','Axis of Rotation','Location','Best');
title('Function y=f(x) and Region');
set(gca,'XLim',xlim)
xlabel('x-axis');
ylabel('y-axis');
fill([xvals xvalsr],[fx(xvals) ones(size(xvalsr))*yr],[0.8 0.8
0.8],'FaceAlpha',0.8)
```

```
subplot(2,1,2)
hold on;
plot(xivals,fx(xivals),'-b','LineWidth',2);
fill([xivals xivalsr],[fx(xivals) ones(size(xivalsr))*yr],[0.8 0.8
0.8],'FaceAlpha',0.8)
fill([xivals xivalsr],[ones(size(xivals))*yr -fx(xivalsr)+2*yr],[1 0.8
0.8],'FaceAlpha',0.8)
plot(xivals,-fx(xivals)+2*yr,'-m','LineWidth',2);
plot([iL(1) iL(2)],[yr yr],'-r','LineWidth',2);
title('Rotated Region in xy-Plane');
set(gca,'XLim',xlim)
xlabel('x-axis');
ylabel('y-axis');
[X,Y,Z] = cylinder(fx(xivals)-yr,100);
figure('Position',[700 200 560 420])
Z = iL(1) + Z.*(iL(2)-iL(1));
surf(Z,Y+yr,X,'EdgeColor','none','FaceColor','flat','FaceAlpha',0.6);
hold on;
plot([iL(1) iL(2)],[yr yr],'-r','LineWidth',2);
xlabel('X-axis');
ylabel('Y-axis');
zlabel('Z-axis');
view(22,11);
```

Input:

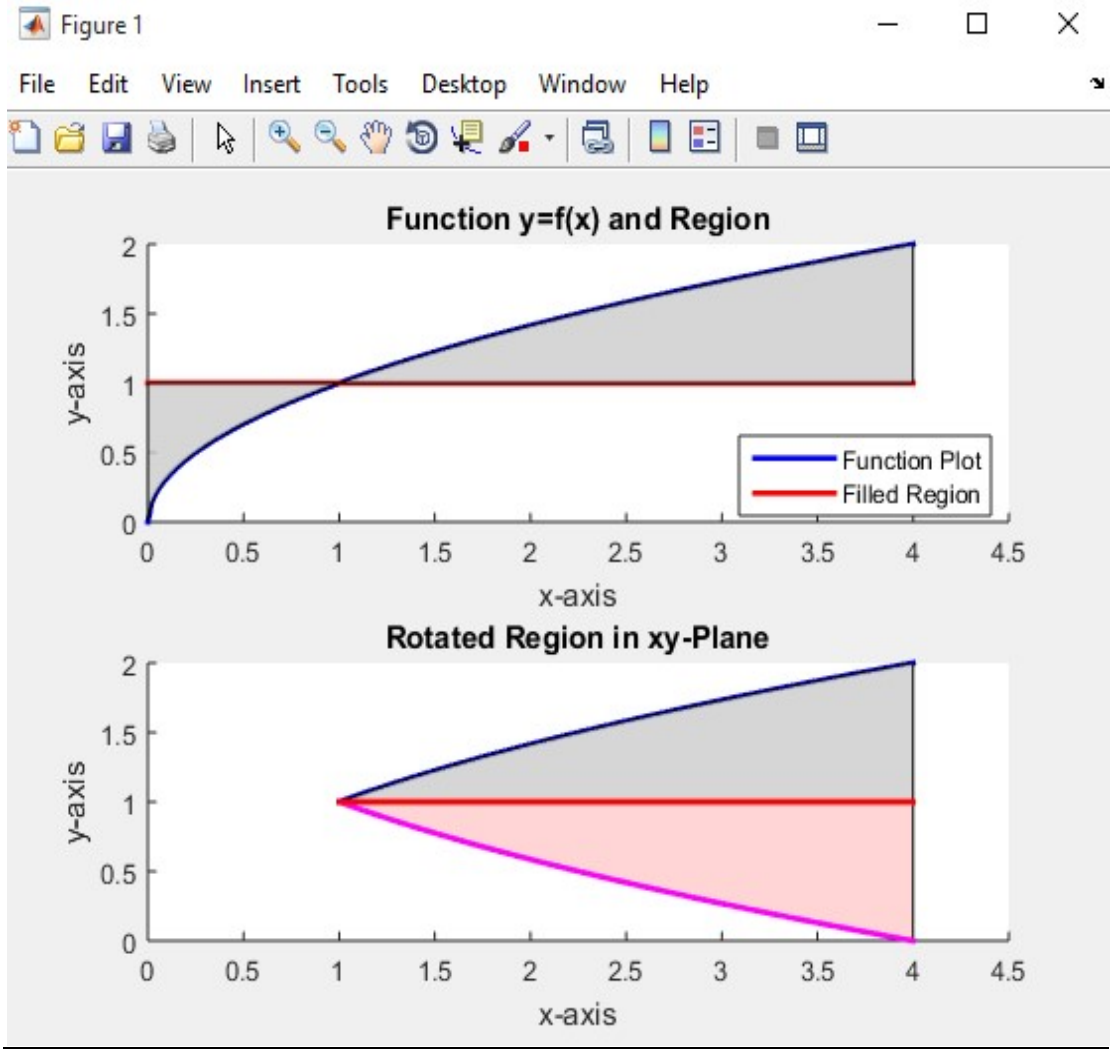


Output:



Graph:

2D plane:



3D plane:

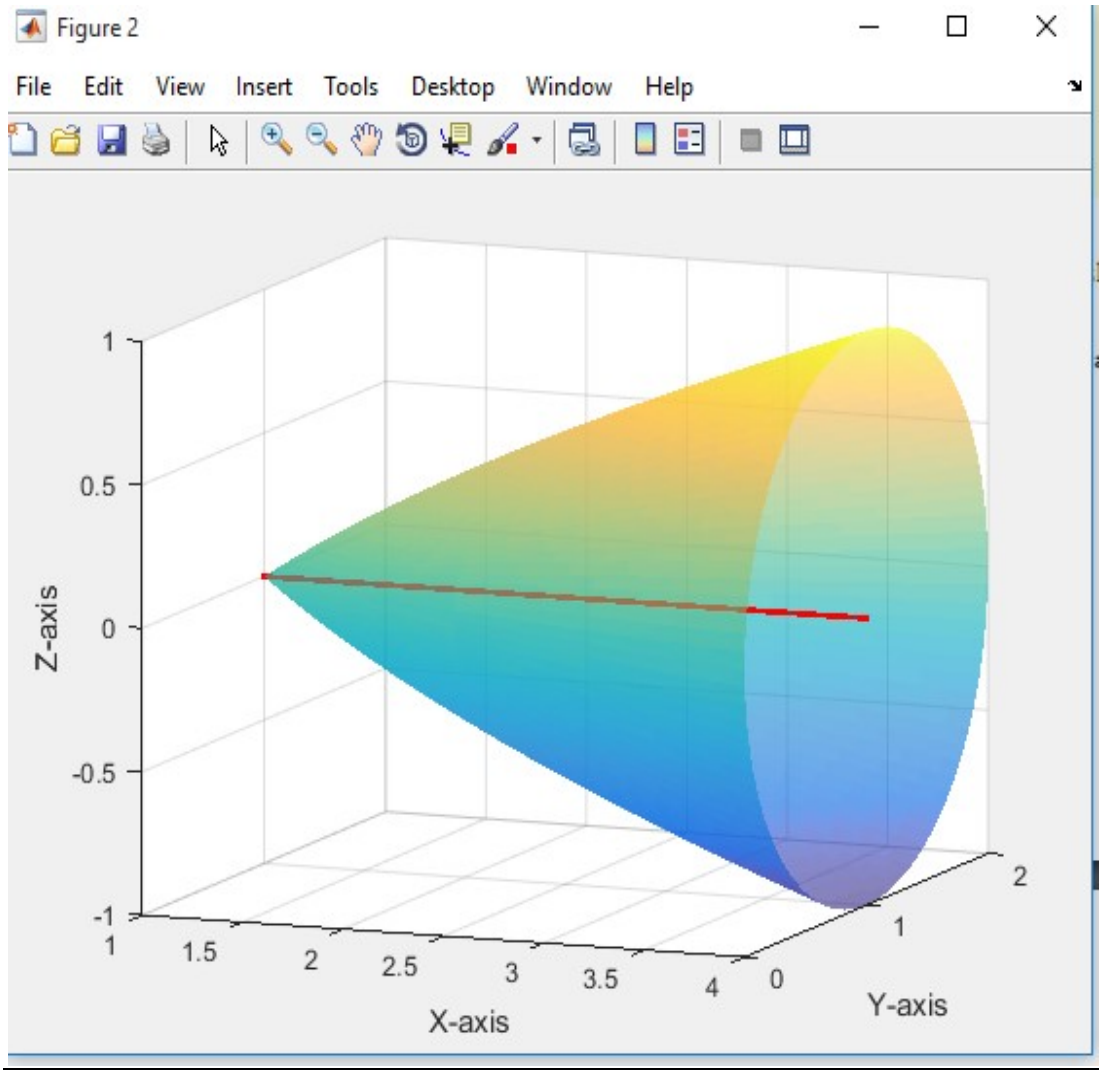


Figure 2
File Edit View Insert Tools Desktop Window Help
1
0.5
0
-0.5
-1
Z-axis
1
1.5
2
2.5
3
3.5
4
X-axis
0
1
2
Y-axis