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MATLAB FAT

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SLOT: L59 + L60

SET-D

ANSWERS IN NEXT PAGE

1. Obtain the maxima and minima value of $f(x,y)=2(y^2-x^2)-y^4+x^4$

CODES:

```
clc
close all
clc
syms x y
f(x,y)=input('Enter function f(x,y) to calculate the maxima/minima');


p=diff(f,x);                    %df/dx
q=diff(f,y);                    %df/dy
[ax,ay]=solve(p,q);
ax=double(ax);
ay=double(ay);

r=diff(p,x);                    %d2f/dx2
s=diff(p,y);                    %d2f/dxdy
t=diff(q,y);                    %d2f/dy2
D=r*t-s^2;


figure
fsurf(f);
xlabel('X-axis');
ylabel('Y-axis');
zlabel('Z-axis');
legstr={'Plot of the given function'};
for i=1:size(ax)
    t1=D(ax(i),ay(i));
    t2=r(ax(i),ay(i));
    t3=f(ax(i),ay(i));

    if (double(t1)==0)
        sprintf('At (%f,%f) further investigation needed',ax(i),ay(i))
        legstr=[legstr,{'Case to investigate further'}];
        mkr='ko';
    elseif (double(t1)<0)
        sprintf('The point(%f,%f) is a saddle point',ax(i),ay(i))
        legstr=[legstr,{'Saddle point'}];
        mkr='bv';
    else
        if (double(t2)<0)
            sprintf('The maximum value is %f at the point(%f,%f)',t3,ax(i),ay(i))
            legstr=[legstr,{'maximum value of function'}];
            mkr='g+';
        else
            sprintf('The minimum  value is %f at the point(%f,%f)',t3,ax(i),ay(i))
            legstr=[legstr,{'minimum value of the function'}];
```

```
            mkr='r+';
        end
    end
    hold on;
    plot3(ax(i),ay(i),t3,mkr,'linewidth',3);
end
legend(legstr,'location','best');
title('Plot of f(x,y) showing maxima/minima')
```

INPUT:

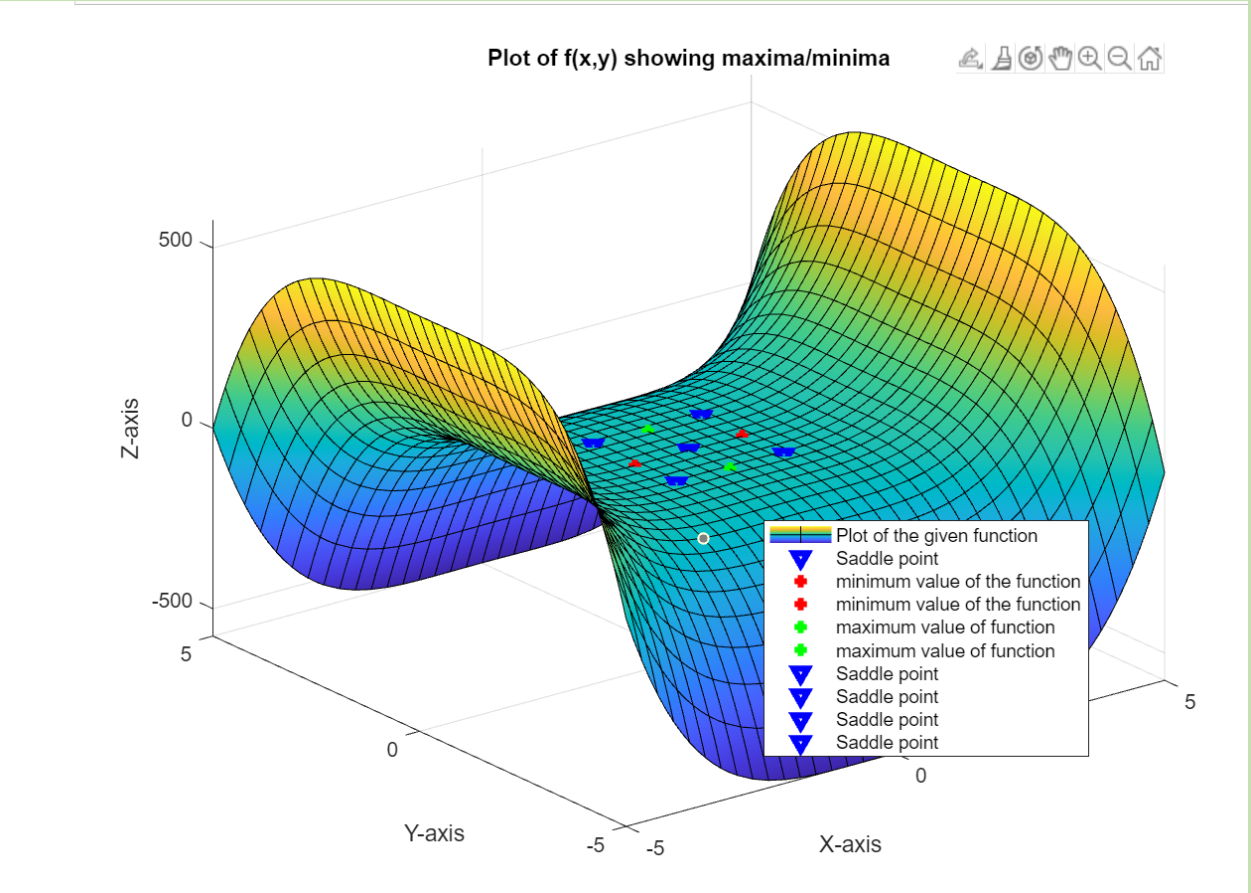
```
Enter function f(x,y) to calculate the maxima/minima
2*(y^2-x^2)-y^4+x^4
```

OUTPUT:

```
ans =

    'The point(0.000000,0.000000) is a saddle point'


ans =

    'The minimum  value is -1.000000 at the point(-1.000000,0.000000)'


ans =

    'The minimum  value is -1.000000 at the point(1.000000,0.000000)'


ans =

    'The maximum value is 1.000000 at the point(0.000000,-1.000000)'


ans =
```

```
    'The maximum value is 1.000000 at the point(0.000000,1.000000)'

ans =

    'The point(-1.000000,-1.000000) is a saddle point'

ans =

    'The point(1.000000,-1.000000) is a saddle point'

ans =
```

RESULTS:



2. Find the volume of the region enclosed by $z= x^2+3y^2$ and $z=6-x^2-y^2$. Use 'input' and add title, legend, axis to the graph.

CODE:

```
clear
close all
clc
syms x y z;
f=input('Enter the function');

%assigning the lomit for integration along x,y,z
za=x^2+3*y^2;
zb=6-x^2-y^2;
ya=-sqrt((3-x^2)/2);
yb=sqrt((3-x^2)/2);
xa=-sqrt(3);
xb=sqrt(3);

%calculating and displaying the total volume of
integration
volume=int(int(int(f,z,za,zb),y,ya,yb),x,xa,xb);

disp("the volume enclosed is")
disp(volume)
```

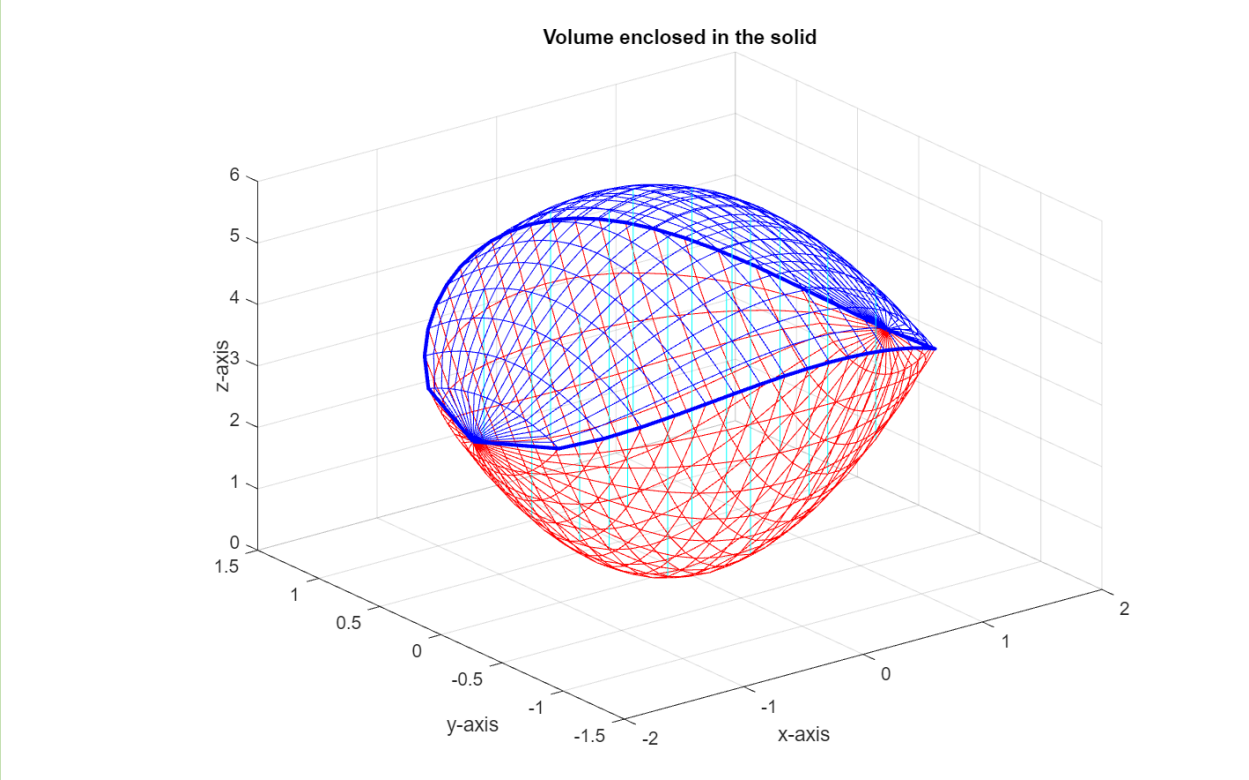
```
%visualizing the 3D plot
viewSolid(z,za,zb,y,ya,yb,x,xa,xb);

grid on;
hold on;

xlabel('x-axis')
ylabel('y-axis')
zlabel('z-axis');

%giving title to the 3D plot
title('Volume enclosed in the solid')
hold off;
```

INPUT:

```
Enter the function
1+0*x
```

OUTPUT:

```
the volume enclosed is
(9*pi*2^(1/2))/2
```


Volume enclosed in the solid
z-axis
6
5
4
3
2
1
0
y-axis
1.5
1
0.5
0
-0.5
-1
-1.5
x-axis
-2
-1
0
1
2