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Reg:20BDS0405

MATLAB FAT

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Class Number: VL2020210505039

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
                                 %df/dy
q=diff(f,y);
[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)</pre>
        sprintf('The point(%f,%f) is a saddle point',ax(i),ay(i))
        legstr=[legstr,{'Saddle point'}];
        mkr='bv';
    else
        if (double(t2)<0)</pre>
            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 =

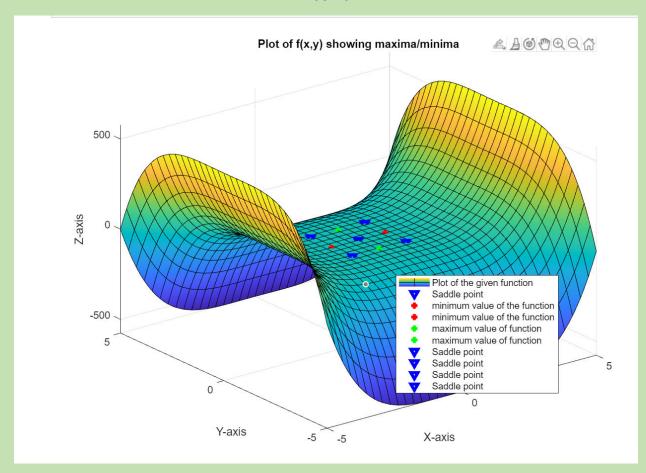
'The point(-1.000000,-1.000000) is a saddle point'

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*v^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');

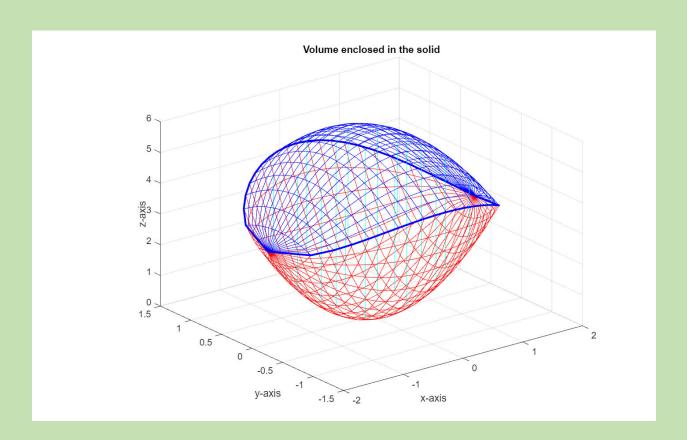
%giving title to the 3D plot
title('Volume enclosed in the solid')
hold off;
```

INPUT:

Enter the function 1+0*x

OUTPUT:

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



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```
8>1>.
     clear its and of any and all and it is a facility of all
     close all
      CIC
     syms x y , has It (71:71) I had the
     f(114) = input ('Enter function f(14)) to calculate maxima/minima');
     b= qell (f'x);
     1 = 91 H (1, A);
  [ax,ay] = salve (p,q);
      ax= double (ax);
     ay = double (ay);
   r=dif (pin);
      s=dif(9,y);
      t= diff (9,4);
      D=r*t-s^2;
      figure
      four (f); xlable(x-axis); ylabel (y-axis); zlabel (z-axis);
```

legebr = { Plot of given function' }.

```
for ?= 1: Size (ax)
       Tr= D(azii), ayli)); 1010000000
       To = $ (ax(i), ay(1));
       T3 = f(ax(?),ay(?));
                                    TATE BATTAM
       if (double (Ti)=D).
            Sprintf ('At ('Af. "1.7) justifier investigation needed', axci), ag(i))
            legstr = [legstr, {'asse to investigate further'}];
            mkr = 1 k01.
       elseif (double(1,)<0)
             sprintf ( At point (% f , % f), it is saddle point, axti), ayti)
             legstr = [legstr. & Saddle paint 3];
             mkr= 'bu'
                                                      : (35, 9) gar. 7
                                                      :4:107111
             specints ( The max value of function is " of at 1 (" of : 15) , T3, ax (i) pi)
            9p (double (T2)<0)
             leg str= [legstr, &' Max value of function' 3]:
              mer = '9+';
              spaintf ( The min value of function is " of at (1.5) - (f), T3, ax (i), ag(i)
            લક્ટ
               legstr = [legstr, ['Mrn value of function' }];
               mer= (r+);
             end
          and
     plot3 (ax(i), ay(i), T3, mar, 'linewidth', 3);
    end
    legand (leg str, 'bocation', 'Best');
    title ( ! Plot of film, y) showing maxima/ minima')
```

Crive input:

Entertunction f (714) to calculate maxima/minima.

2*(y^2-x^2)-y^4+x^4.

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```
8>2) Find the volume of region exclosed by Z=x^2+3y^2

Z=6-x^2-y^2.

Use "input" and add title, axis, to the graph.
```

```
Clear
  Close all
  CIG
  Syms x, y z;
  f = "nput (" Enter the function").
 2 2 × 2 + 3* y x 2 ;
  Zb = 6-12-412;
 fa = - SqH (3-x 12)/2);
 46 = Sart ((3-71/2);
 xa = - sqrt (3);
 76 = Sqrt(3);
 Volume= int (int lint (func, z, za izb), y, bya, yb), x, xa, xb);
 disp (" The total volume enllosed is ");
 disp ( volume)
Viewsolid (z, za, zb, y, ya, yb, x, xa, xb);
dug ou?
hold on",
x-lable (x-axis'); ylabel (y-axis'); zlabel ('z-axis');
Little ("Volume enclosed by the two functions (region D)")
hold off;
```