MATLAB EXPERIMENT-6

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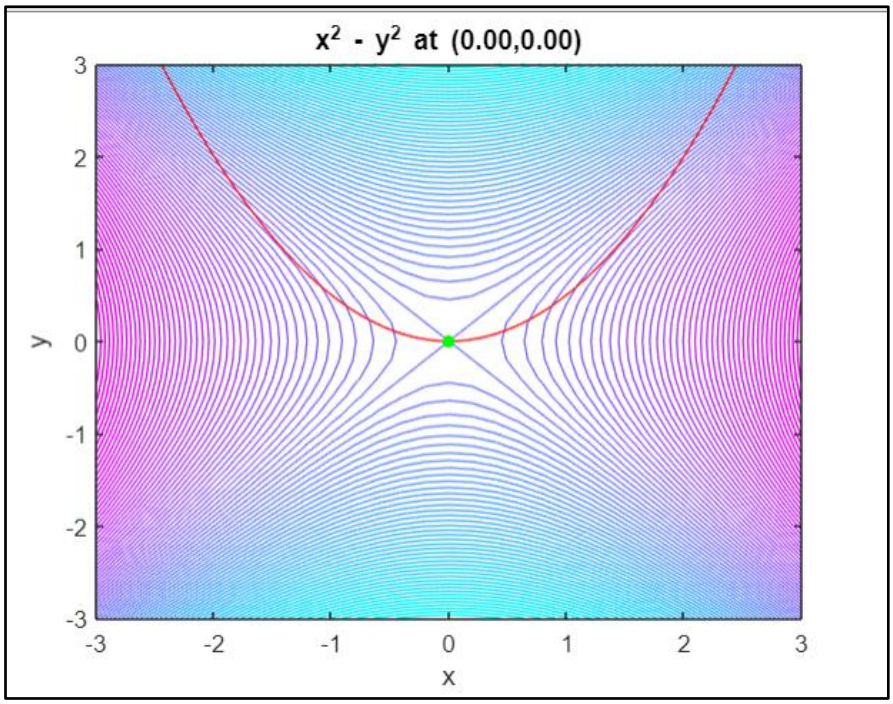
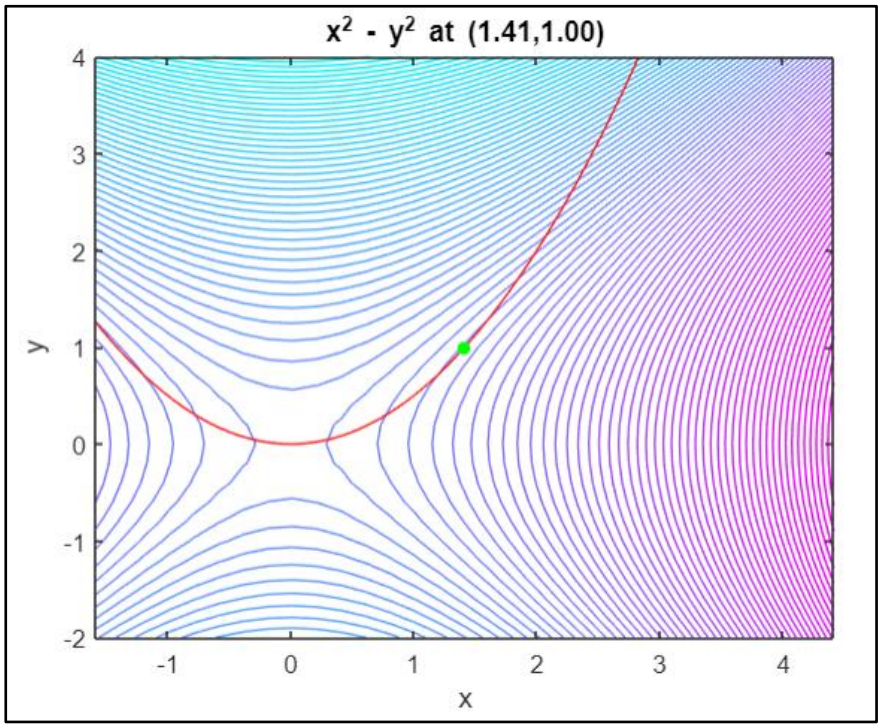
Q1 Find the extreme values of the function f(x,y)=x^2-y^2 subject to the constraints 2y-x^2=0

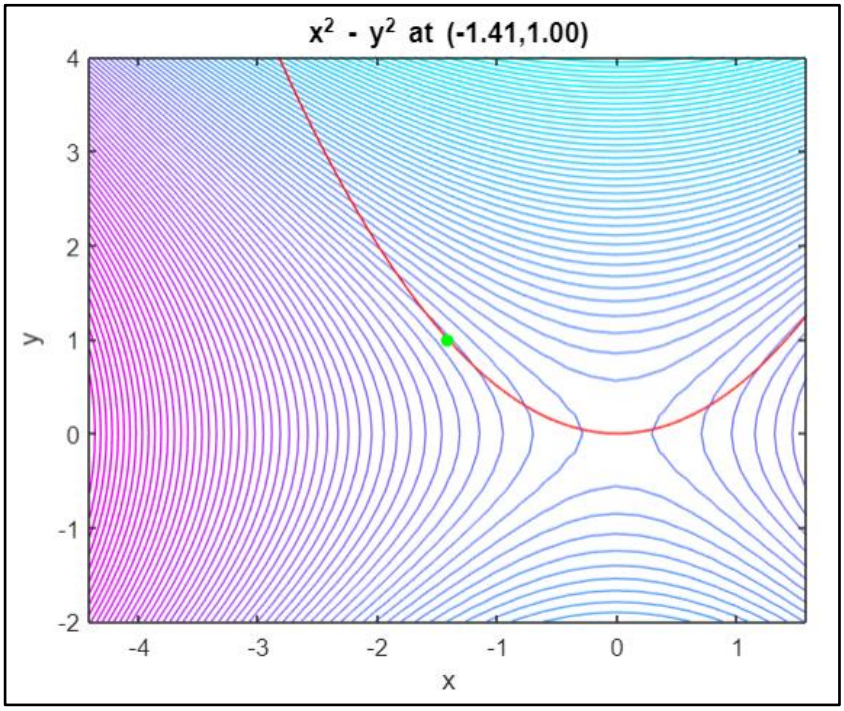
CODE:-

```
clc
clear
syms x y l real
f=x^2-y^2;
g=2*y-x^2;
[lam,x1,y1]=solve(jacobian(f-l*g,[x,y,l]));
x1=double(x1);y1=double(y1);
t=double(subs(f,{x,y},{x1,y1}));
x2=0;y2=0;k=t(1);
for i=1:size(t)
    figure
    sprintf("The critical points are (%.2f,%.2f)",x1(i),y1(i))
    sprintf("The extreme value of func is %.3f",t(i))

    [X1,Y1]=meshgrid(x1(i)-3:0.2:x1(i)+3,y1(i)-3:0.2:y1(i)+3);
    Z2=@(x,y)eval(vectorize(f));
    Z1=Z2(X1,Y1);
   contour(X1,Y1,Z1,85),colormap("cool");
   hold on
   s=ezplot(g,[x1(i)-3 x1(i)+3 y1(i)-3 y1(i)+3]);
   set(s,'Color',[1,0.1,0.1]);
   str=sprintf("%s at (%.2f,%.2f)",f,x1(i),y1(i));
   title(str)
   plot(x1(i),y1(i),'g.','markersize',15);
end
```

OUTPUT:-


x² - y² at (0.00,0.00)
3
2
1
0
-1
-2
-3
y
-3
-2
-1
0
1
2
3
x


x² - y² at (1.41,1.00)
4
3
2
1
0
-1
-2
y
-1
0
1
2
3
4
x



COMMAND WINDOW

```
ans =

    "The critical points are (0.00,0.00)"


ans =

    "The extreme value of func is 0.000"


ans =

    "The critical points are (1.41,1.00)"


ans =

    "The extreme value of func is 1.000"


ans =

    "The critical points are (-1.41,1.00)"


 ans =

     "The extreme value of func is 1.000"

>>
```

Q2 Find the extreme values of the function f(x,y)=2x+2xy+y subject to constraints 2x+y=100

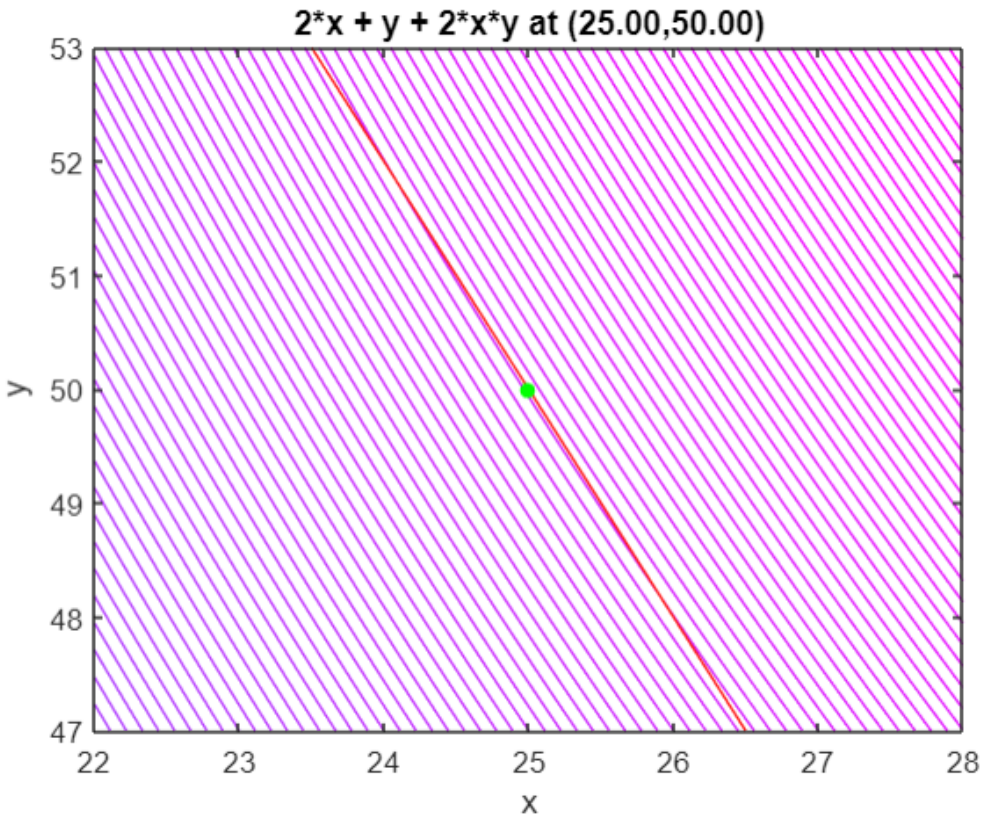
CODE:-

```
clc
clear
syms x y l real
f=2*x +y+2*x*y;
g=2*x+y-100;
[lam,x1,y1]=solve(jacobian(f-l*g,[x,y,l]));
x1=double(x1);y1=double(y1);
t=double(subs(f,{x,y},{x1,y1}));
x2=0;y2=0;k=t(1);
for i=1:size(t)
    figure
    sprintf("The critical points are (%.2f,%.2f)",x1(i),y1(i))
    sprintf("The extreme value of func is %.3f",t(i))

    [X1,Y1]=meshgrid(x1(i)-3:0.2:x1(i)+3,y1(i)-3:0.2:y1(i)+3);
    Z2=@(x,y)eval(vectorize(f));
    Z1=Z2(X1,Y1);
   contour(X1,Y1,Z1,85),colormap("cool");
   hold on
   s=ezplot(g,[x1(i)-3 x1(i)+3 y1(i)-3 y1(i)+3]);
   set(s,'Color',[1,0.1,0.1]);
   str=sprintf("%s at (%.2f,%.2f)",f,x1(i),y1(i));
   title(str)

   plot(x1(i),y1(i),'g.','markersize',15);

end
```

OUTPUT:-

COMMAND WINDOW

```
ans =

    "The critical points are (25.00,50.00)"


ans =

    "The extreme value of func is 2600.000"
```

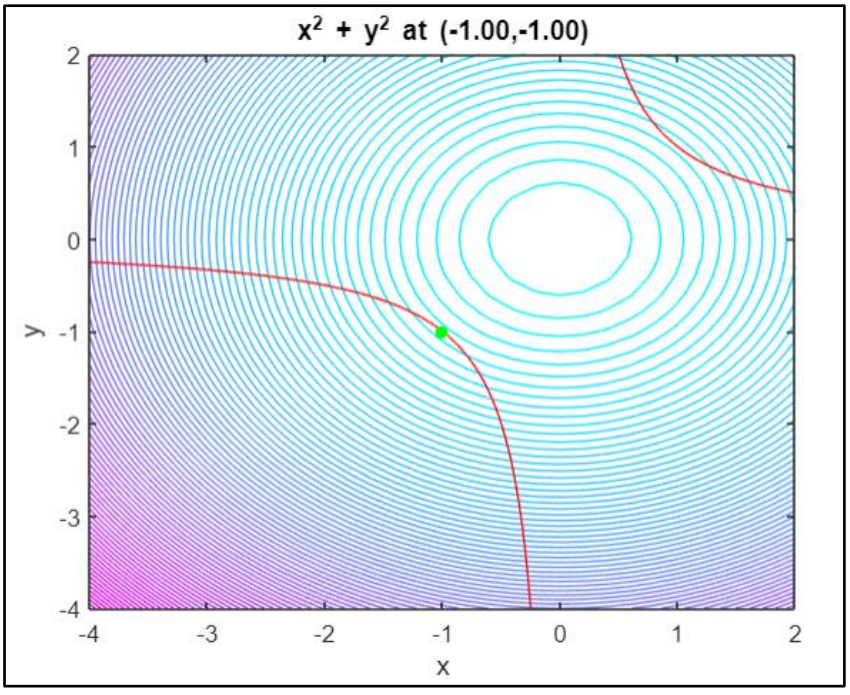

2*x + y + 2*x*y at (25.00,50.00)
53
52
51
50
49
48
47
y
22
23
24
25
26
27
28
x

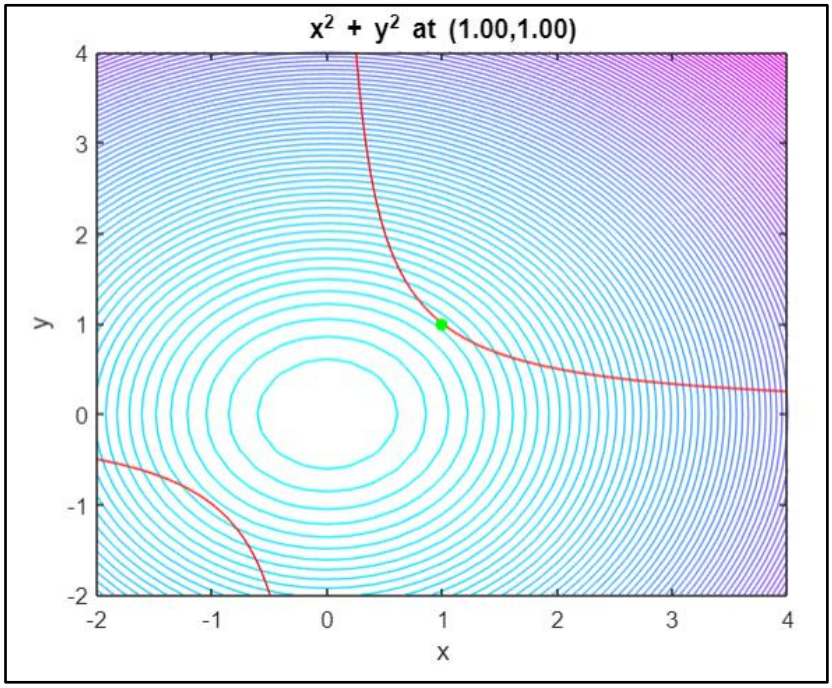
Q3 Find the extreme values of the function f(x,y)=x^2+y^2 subject to constraints xy=1

CODE:-

```
clc
clear
syms x y l real
f=x^2+y^2;
g=x*y-1;
[lam,x1,y1]=solve(jacobian(f-l*g,[x,y,l]));
x1=double(x1);y1=double(y1);
t=double(subs(f,{x,y},{x1,y1}));
x2=0;y2=0;k=t(1);
for i=1:size(t)
    figure
    sprintf("The critical points are (%.2f,%.2f)",x1(i),y1(i))
    sprintf("The extreme value of func is %.3f",t(i))

    [X1,Y1]=meshgrid(x1(i)-3:0.2:x1(i)+3,y1(i)-3:0.2:y1(i)+3);
    Z2=@(x,y)eval(vectorize(f));
    Z1=Z2(X1,Y1);
   contour(X1,Y1,Z1,85),colormap("cool");
   hold on
   s=ezplot(g,[x1(i)-3 x1(i)+3 y1(i)-3 y1(i)+3]);
   set(s,'Color',[1,0.1,0.1]);
   str=sprintf("%s at (%.2f,%.2f)",f,x1(i),y1(i));
   title(str)

   plot(x1(i),y1(i),'g.','markersize',15);

end
```

OUTPUT:-





COMMAND WINDOW

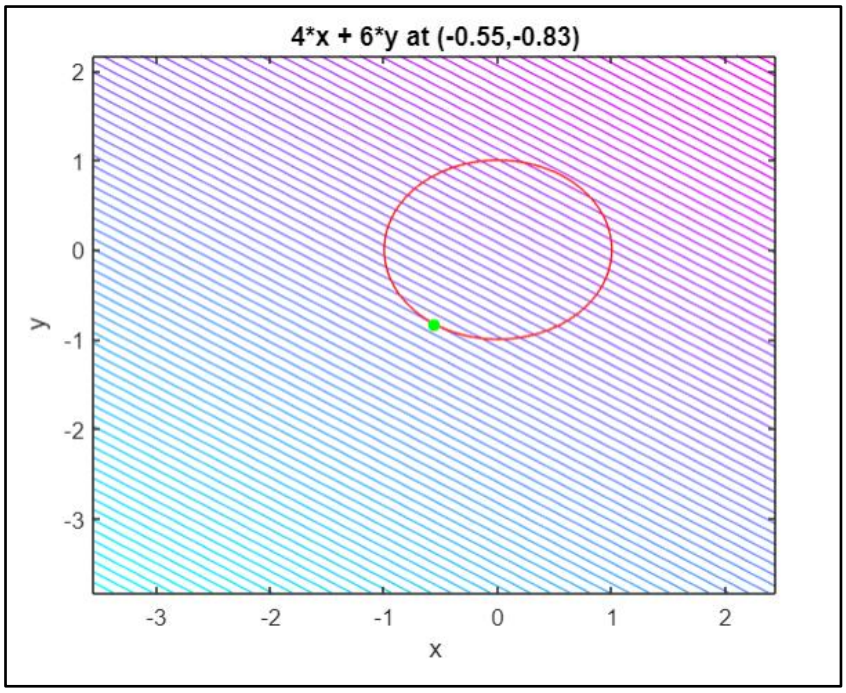
```
ans =

    "The critical points are (-1.00,-1.00)"


ans =

    "The extreme value of func is 2.000"


ans =

    "The critical points are (1.00,1.00)"


ans =

    "The extreme value of func is 2.000"
```

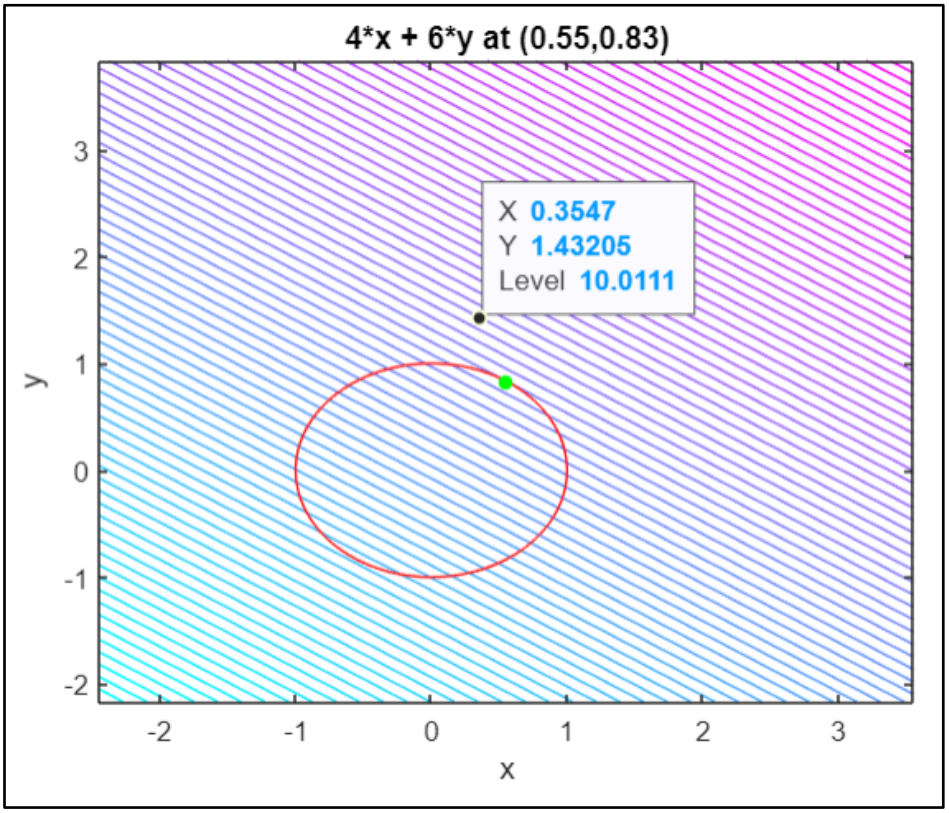
Q4 Find the extreme values of the function f(x,y)=4x+6y subject to constraints x^2+y^2=1

CODE:-

```
clear
syms x y l real
f=4*x+6*y;
g=x^2+y^2-1;
[lam,x1,y1]=solve(jacobian(f-l*g,[x,y,l]));
x1=double(x1);y1=double(y1);
t=double(subs(f,{x,y},{x1,y1}));
x2=0;y2=0;k=t(1);
for i=1:size(t)
    figure
    sprintf("The critical points are (%.2f,%.2f)",x1(i),y1(i))
    sprintf("The extreme value of func is %.3f",t(i))

    [X1,Y1]=meshgrid(x1(i)-3:0.2:x1(i)+3,y1(i)-3:0.2:y1(i)+3);
    Z2=@(x,y)eval(vectorize(f));
    Z1=Z2(X1,Y1);
   contour(X1,Y1,Z1,85),colormap("cool");
   hold on
   s=ezplot(g,[x1(i)-3 x1(i)+3 y1(i)-3 y1(i)+3]);
   set(s,'Color',[1,0.1,0.1]);
   str=sprintf("%s at (%.2f,%.2f)",f,x1(i),y1(i));
   title(str)

   plot(x1(i),y1(i),'g.','markersize',15);
end
```

OUTPUT:-





COMMAND WINDOW

```
ans =

    "The critical points are (-0.55,-0.83)"


ans =

    "The extreme value of func is -7.211"


ans =

    "The critical points are (0.55,0.83)"


ans =

    "The extreme value of func is 7.211"
```