MATLAB EXPERIMENT-3

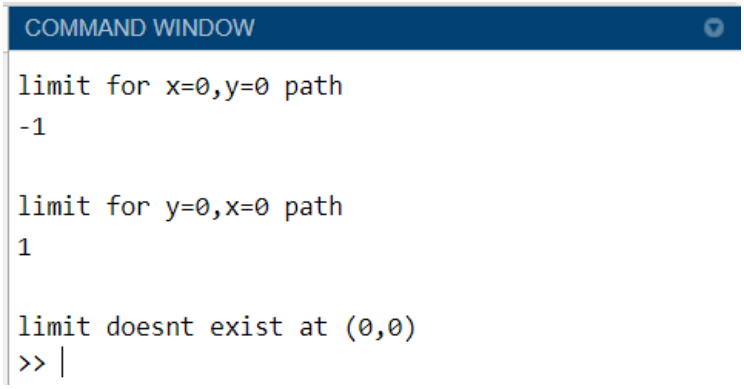
20BCE1209

Q1 Show that $\lim_{(x,y)\to(0,0)} (x^2 - y^2)/(x^2 + y^2)$ does not exists

CODE:-

```
clear
clc
syms x y
f=(x^2-y^2)/(x^2+y^2);
l=limit(limit(f,x,0),y,0); %x=0,y=0 path
l1=limit(limit(f,y,0),x,0);%y=0,x=0 path
disp("limit for x=0,y=0 path");
disp(l);
disp("limit for y=0,x=0 path");
disp(l1);
if l==l1
    k=subs(f,y,x);
    k=simplify(k);
    l2=limit(k,x,0);%x=y path
    disp("limit for x=y path");
        disp(l3);
    if l==l2

        disp("Limit may exist")

    else
        disp("limit doesnt exist at (0,0)")

    end
else
    disp("limit doesnt exist at (0,0)")
end
```

OUTPUT:-

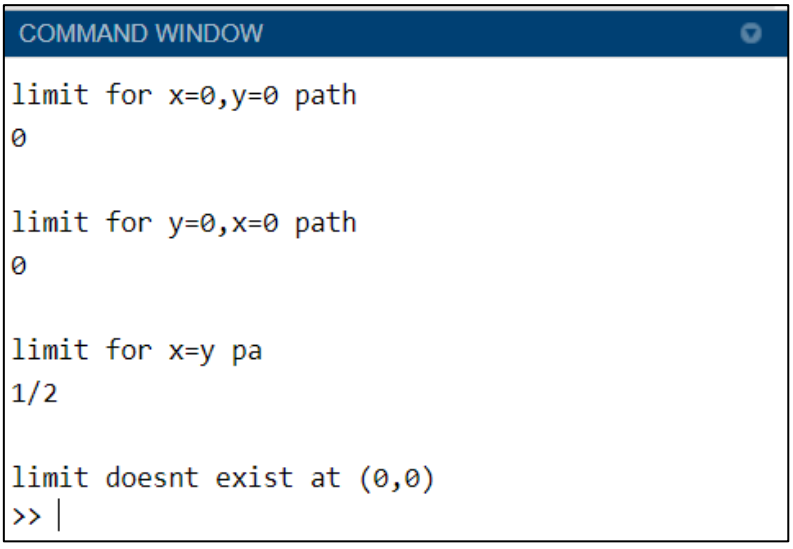


Q2 Show that $\lim_{(x,y)\to(0,0)} (xy)/(x^2+y^2)$ does not exists.

CODE:-

```
clear
clc
syms x y
f=(x*y)/(x^2+y^2);
l=limit(limit(f,x,0),y,0); %x=0,y=0 path
l1=limit(limit(f,y,0),x,0);%y=0,x=0 path
disp("limit for x=0,y=0 path");
disp(l);
disp("limit for y=0,x=0 path");
disp(l1);
if l==l1
    k=subs(f,y,x);
    k=simplify(k);
    l2=limit(k,x,0);%x=y path
    disp("limit for x=y pa");
        disp(l2);
    if l==l2

        disp("Limit may exist")

    else
        disp("limit doesnt exist at (0,0)")

    end
else
    disp("limit doesnt exist at (0,0)")
end
```

OUTPUT:-

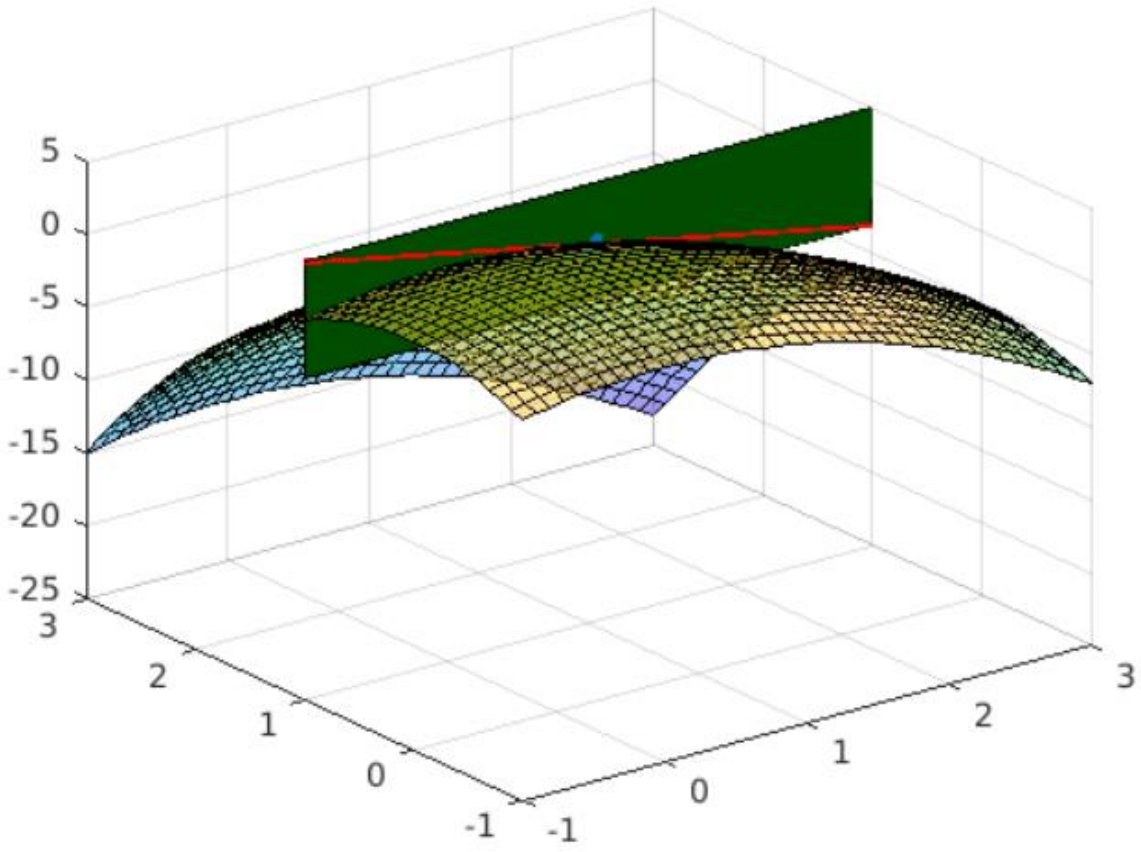


Q3 Find the partial derivative of $F(x,y)=4-x^2-2y^2$ with respect to x at the point $(1,1)$ and visualize it.

CODE:-

```
clc
clear
hold off
syms x y
z=4-x^2-2*y^2;
x0=1;
y0=1;
ex=2;ey=2;ez=4;
x0=double(x0);
y0=double(y0);
x1=x0-ex:0.1:x0+ex;
y1=y0-ey:0.1:y0+ey;
[X,Y]=meshgrid(x1,y1);
Z=4-X.^2-2*Y.^2;
s=surf(X,Y,Z,"FaceAlpha",0.5);


hold on
zx=diff(z,x);
disp("partial derivative of z(x,y).w.r.t.x");
disp(zx)
disp("partial derivative of z(x,y).w.r.t.x at [1,1] is");

zx0=subs(zx,[x,y],[x0,y0]);
zx0=double(zx0);
disp(zx0);
z0=subs(z,[x,y],[x0,y0]);
z0=double(z0);
z1=z0-ez:0.1:z0+ez;
[X2,Z2]=meshgrid([x0-ex x0+ex],[z0-ez z0+ez]);
Y2=ones(size(X2));
surf(X2,Y2,Z2,'FaceColor',[0.0,0.3,0.0])
plot3(x0,y0,z0,'.',"MarkerSize",30);



t=linspace(-ex,ex,10);
x3=x0+t; y3=y0*ones(size(t)); z3=z0+zx0*t;
line(x3,y3,z3,'color','red','linewidth',2);
```

OUTPUT:-



COMMAND WINDOW

```
partial derivative of z(x,y).w.r.t.x
-2*x

partial derivative of z(x,y).w.r.t.x
    -2
```

Q4 Find the partial derivatives of $F(x,y) = x^3 + y^3 + 6xy - 1$ with respect to y at the point (1,1).

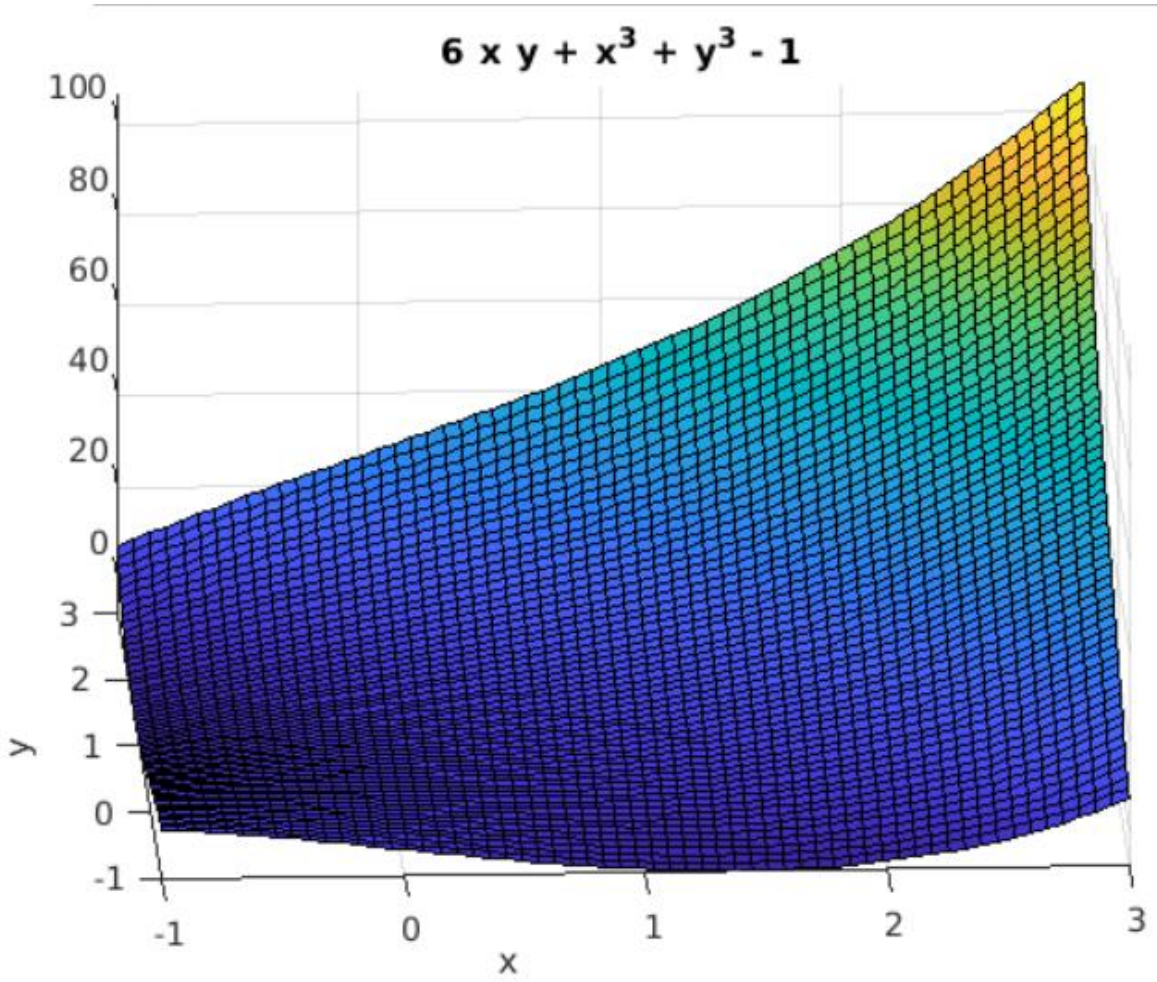
CODE

```
clc
clear
hold off
syms x y
z=x^3+y^3+6*x*y-1;
x0=1;
y0=1;
ex=2;ey=2;ez=4;
x0=double(x0);
y0=double(y0);
D=[x0-ex x0+ex y0-ey y0+ey];
ezsurf(z,D);
zx=diff(z,x);
disp("partial derivative of z(x,y).w.r.t.x");
disp(zx)
disp("partial derivative of z(x,y).w.r.t.x");
zx0=subs(zx,[x,y],[x0,y0]);
zx0=double(zx0);
disp(zx0);
zy=diff(z,y);
disp("partial derivative of z(x,y).w.r.t.y");
disp(zy)
disp("partial derivative of z(x,y).w.r.t.y");
zy0=subs(zy,[x,y],[x0,y0]);
zy0=double(zy0);
disp(zy0);
```

OUTPUT:-

COMMAND WINDOW

```
partial derivative of z(x,y).w.r.t.x
3*x^2 + 6*y

partial derivative of z(x,y).w.r.t.x
     9

partial derivative of z(x,y).w.r.t.y
3*y^2 + 6*x

partial derivative of z(x,y).w.r.t.y
     9

>>
```

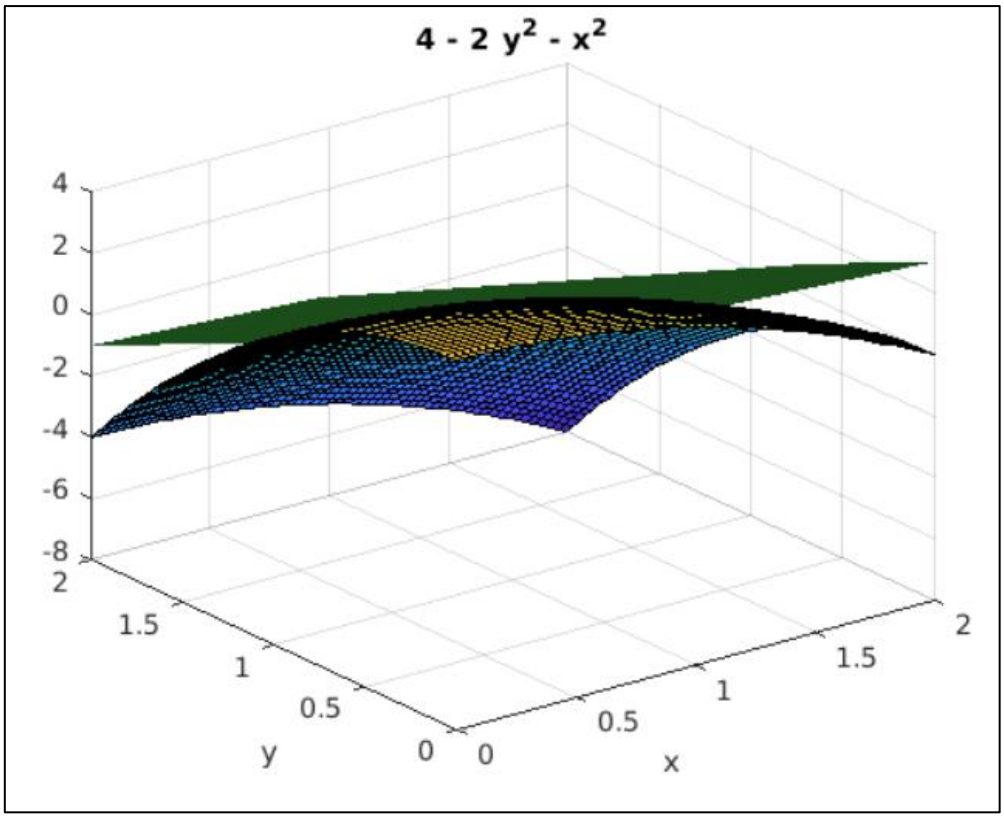

6 x y + x^3 + y^3 - 1
100
80
60
40
20
0
3
2
1
0
-1
y
-1
0
1
2
3
x

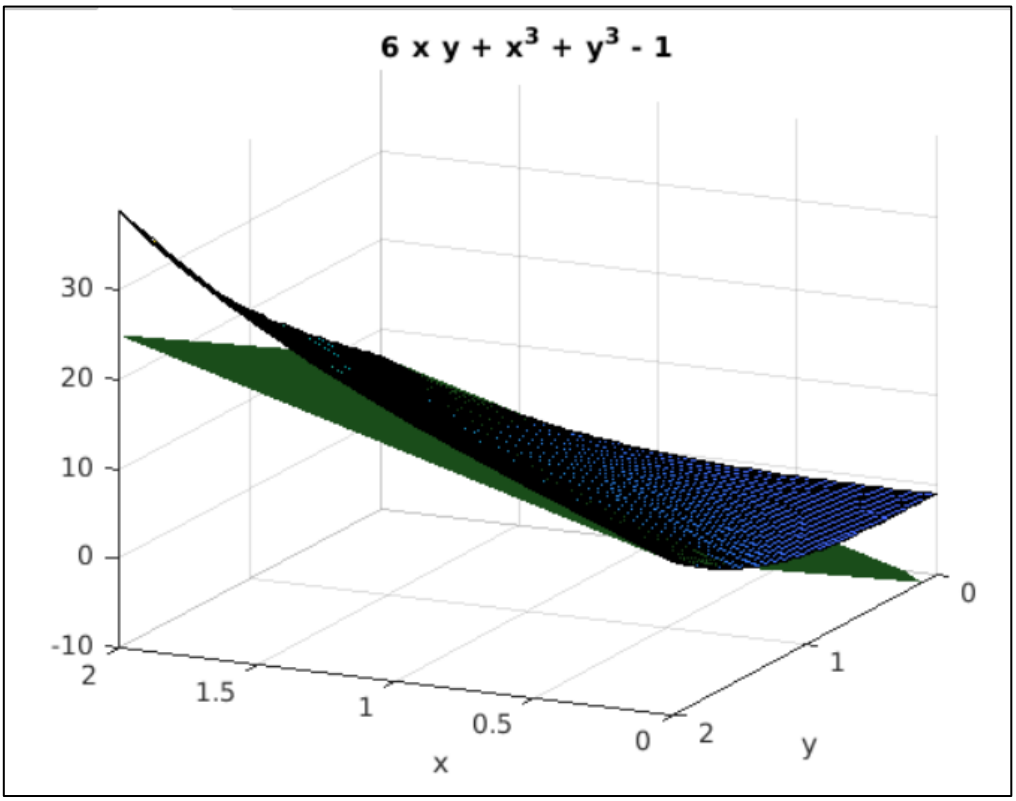
Q5 Draw the tangent planes of the questions (3) and (4)

CODE:-

```
clc
clear
syms x y
x0=double(1);y0=double(1);
ex=double(1);ey=double(1);ez=double(1);
D=[x0-ex x0+ex y0-ey y0+ey];
f=[4-x^2-2*y^2,x^3+y^3+6*x*y-1];
for i=1:2

    z=f(i);
    figure
    ezsurf(z,D);
    hold on
    z0=subs(z,[x,y],[x0,y0]);
    z0=double(z0);
    plot3(x0,y0,z0,'MarkerSize',20);
    zx=diff(z,x);
    zy=diff(z,y);
    zx0=subs(zx,[x,y],[x0,y0]);zx0=double(zx0);
    zy0=subs(zy,[x,y],[x0,y0]);zy0=double(zy0);
    [X,Y]=meshgrid([x0-ex x0+ex],[y0-ey y0+ey]);
    Z=z0+zx0*(X-x0)+zy0*(Y-y0);
    surf(X,Y,Z,'FaceColor',[0.1,0.3,0.1],'EdgeColor','none')

    end
```

OUTPUT:-


4 - 2 y^2 - x^2
4
2
0
-2
-4
-6
-8
2
1.5
1
0.5
0
y
0
0.5
1
1.5
2
x


6 x y + x^3 + y^3 - 1
30
20
10
0
-10
2
1.5
1
0.5
0
x
0
1
2
y