Name: Kulvir Singh **MATLAB DA 2** **REG NUMBER:19BCE2074**

Question 1:

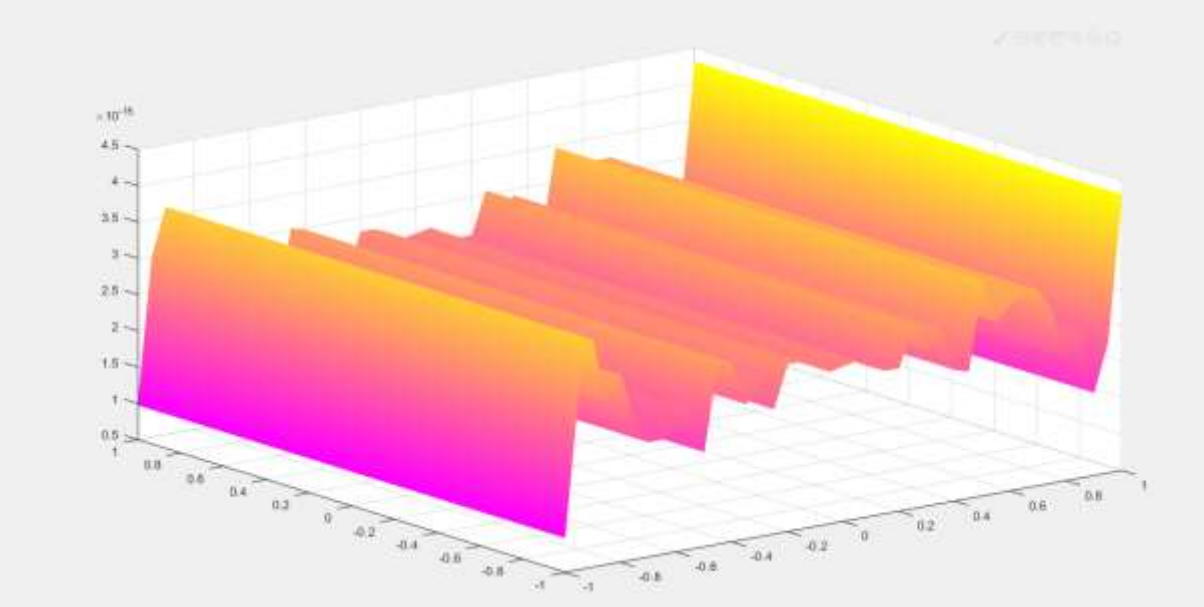
Code:

Editor - E:\matlab\bin\mathsela.m

mathsela.m

```
x=-1:.05:1;
y=-1:.05:1;
[x,y]=meshgrid(x,y);
z=x*(x^2+y^2)
surf(x,y,z);
colormap spring
shading interp
```

Output:



Question 2:

Code:

mathsela.m

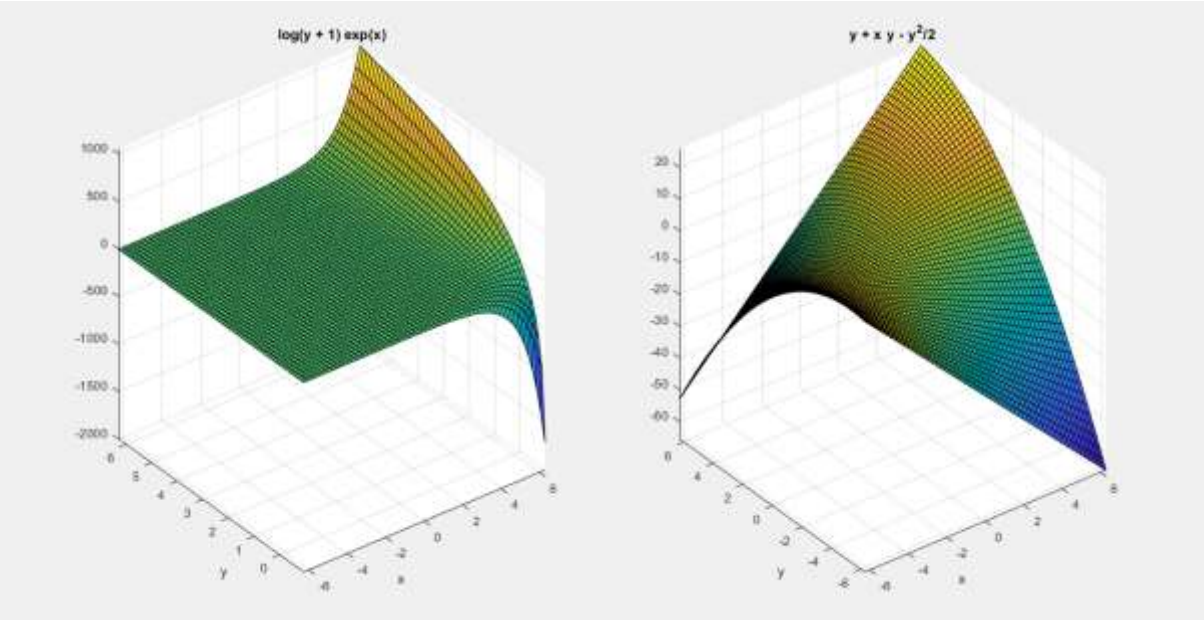
```
clc
clearvars
close all
syms x y
f = input('Enter the function f(x,y): ');
I = input('Enter the point [a,b] at which Taylor series is sought: ');
a = I(1);b=I(2);
n=input('enter the order of series:');
tayser=taylor(f,[x,y],[a,b],'order',n);
subplot(1,2,1);
ezsurf(f);
subplot(1,2,2);
ezsurf(tayser);
```

Input:

Command Window

```
Enter the function f(x,y): exp(x)*log(y+1)
Enter the point [a,b] at which Taylor series is sought: [0,0]
enter the order of series:3
>>
```

Output:



Question 3:

Code:

Editor - E:\matlab\bin\mathsela.m

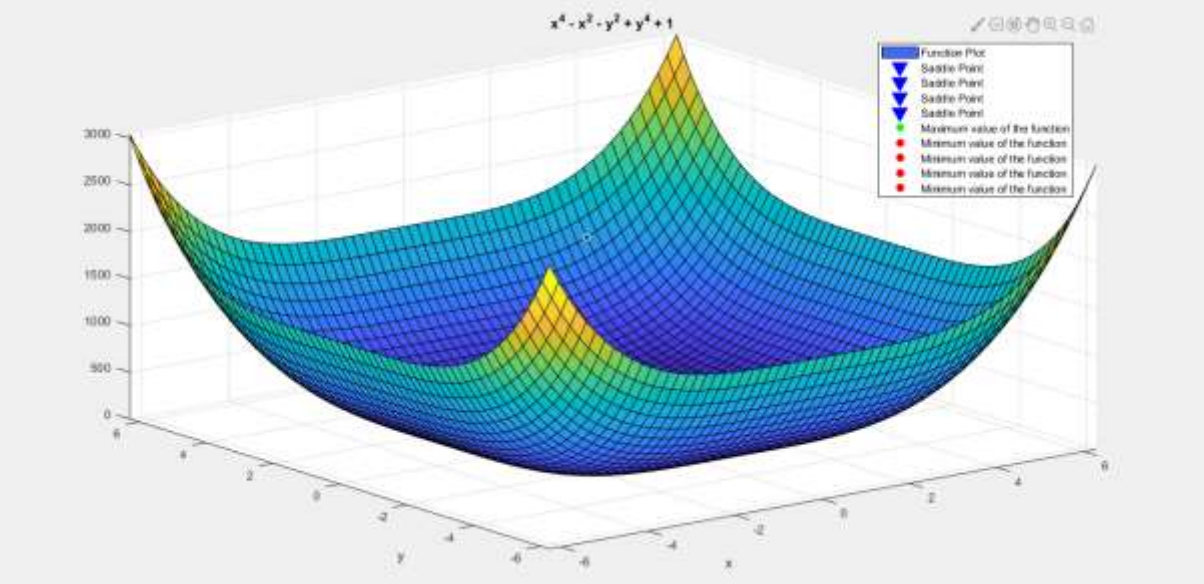
mathsela.m

```
clc
clear all
syms x y
f= input('Enter the function f(x,y):');
p= diff(f,x); q=diff(f,y);
[ax,ay]=solve(p,q);
ax=double(ax);ay=double(ay);
r= diff(p,x); s=diff(p,y); t =diff(q,y);D=r*t-s^2;
figure
ezsurf(f);
legstr={'Function Plot'};% for Legend
for i=1:size(ax)
T1=subs(D,{x,y},{ax(i),ay(i)});
T2=subs(r,{x,y},{ax(i),ay(i)});
T3=subs(f,{x,y},{ax(i),ay(i)});
if (double(T1) == 0)
sprintf('At (%f,%f) further investigation is required', ax(i),ay(i))
legstr=[legstr,{'Case of Further investigation'}];
mkr='ko';
elseif (double(T1) < 0)
sprintf('The point (%f,%f) is a saddle point', ax(i),ay(i))
legstr=[legstr,{'Saddle Point'}]; % updating Legend
mkr='bv'; % marker
else
if (double(T2) < 0)
sprintf('The maximum value of the function is f(%f,%f)=%f',ax(i),ay(i),double(T3))
legstr=[legstr,{'Maximum value of the function'}];% updating Legend
mkr='g+';% marker
else
sprintf('The minimum value of the function is f(%f,%f)=%f',ax(i),ay(i),double(T3))
legstr=[legstr,{'Minimum value of the function'}];% updating Legend
mkr='r*'; % marker
end
end
hold on
```

```
    end
    hold on
    plot3(ax(i),ay(i),T3,mkr,'Linewidth',4);
    end
    legend(legstr,'Location','Best');
```

Input/Output:

```
Enter the function f(x,y):x^4+y^4-x^2-y^2+1

ans =

    'The point (-0.707107,0.000000) is a saddle point'


ans =

    'The point (0.707107,0.000000) is a saddle point'


ans =

    'The point (0.000000,-0.707107) is a saddle point'


ans =

    'The point (0.000000,0.707107) is a saddle point'


ans =

    'The maximum value of the function is f(0.000000,0.000000)=1.000000'


ans =

    'The minimum value of the function is f(-0.707107,-0.707107)=0.500000'


ans =

    'The minimum value of the function is f(0.707107,-0.707107)=0.500000'

fx

ans =

    'The minimum value of the function is f(-0.707107,0.707107)=0.500000'


ans =

    'The minimum value of the function is f(0.707107,0.707107)=0.500000'

>>
```



Question 4

Code:

Editor - E:\matlab\bin\mathsela.m

mathsela.m

```
clc
clear all
syms x y
f= input('Enter the function f(x,y):');
p= diff(f,x); q=diff(f,y);
[ax,ay]=solve(p,q);
ax=double(ax);ay=double(ay);
r= diff(p,x); s=diff(p,y); t =diff(q,y);D=r*t-s^2;
figure
ezsurf(f);
legstr={'Function Plot'};% for Legend
for i=1:size(ax)
T1=subs(D,{x,y},{ax(i),ay(i)});
T2=subs(r,{x,y},{ax(i),ay(i)});
T3=subs(f,{x,y},{ax(i),ay(i)});
if (double(T1) == 0)
sprintf('At (%f,%f) further investigation is required', ax(i),ay(i))
legstr=[legstr,{'Case of Further investigation'}];
mkr='ko';
elseif (double(T1) < 0)
sprintf('The point (%f,%f) is a saddle point', ax(i),ay(i))
legstr=[legstr,{'Saddle Point'}]; % updating Legend
mkr='bv'; % marker
else
if (double(T2) < 0)
sprintf('The maximum value of the function is f(%f,%f)=%f',ax(i),ay(i),double(T3))
legstr=[legstr,{'Maximum value of the function'}];% updating Legend
mkr='g+';% marker
else
sprintf('The minimum value of the function is f(%f,%f)=%f',ax(i),ay(i),double(T3))
legstr=[legstr,{'Minimum value of the function'}];% updating Legend
mkr='r*'; % marker
end
end
hold on
```

```
    end
    hold on
    plot3(ax(i),ay(i),T3,mkr,'Linewidth',4);
    end
    legend(legstr,'Location','Best');
```

Input/Output:

```
Enter the function f(x,y):x^3+3*x*y*y-15*x^2-15*y^2+72*x

ans =

    'The maximum value of the function is f(4.000000,0.000000)=112.000000'


ans =

    'The minimum value of the function is f(6.000000,0.000000)=108.000000'


ans =

    'The point (5.000000,-1.000000) is a saddle point'


ans =

    'The point (5.000000,1.000000) is a saddle point'

>>
```