24BMH1112

Rahul LJ

MAXIMUM AND MINIMUM VALUE

```
% Local maxima and minima for two variables
clc
clear all
close all
format compact
%%
syms x y real
f =input('Enter the function f(x,y): ');
fx = diff(f,x)
fy = diff(f,y)
[ax ay] = solve(fx,fy)
fxx = diff(fx,x)
D = fxx*diff(fy,y) - diff(fx,y)^2%ln-m^2

%% Collecting critical points

r=1;
for k=1:1:size(ax)
if ((imag(ax(k))==0)&&(imag(ay(k))==0))
ptx(r)=ax(k);
pty(r)=ay(k);
r=r+1;
end
end

%% Visulalizing the function

a1=max(double(ax))
a2=min(double(ax))
b1=max(double(ay))
b2=min(double(ay))
ezsurf(f,[a2-.5,a1+.5,b2-.5,b1+.5])
colormap('summer');
shading interp
hold on

%% Finding the maximum and minimum values of the function and their visulaization

for r1=1:1:(r-1)
T1=subs(subs(D,x,ptx(r1)),y,pty(r1))
T2=subs(subs(fxx,x,ptx(r1)),y,pty(r1))
if (double(T1) == 0)
sprintf('The point (x,y) is (%d,%d) and need further investigation',
double(ptx(r1)),double(pty(r1)))
elseif (double(T1) < 0)
T3=subs(subs(f,x,ptx(r1)),y,pty(r1))
sprintf('The point (x,y) is (%d,%d) a saddle point',
double(ptx(r1)),double(pty(r1)))
plot3(double(ptx(r1)),double(pty(r1)),double(T3),'b.','markersize',30);
else
if (double(T2) < 0)
```

```
sprintf('The maximum point(x,y) is (%d, %d)', double(ptx(r1)),double(pty(r1)))
T3=subs(subs(f,x,ptx(r1)),y,pty(r1))
sprintf('The value of the function is %d', double(T3))
plot3(double(ptx(r1)),double(pty(r1)),double(T3),'r+','markersize',30);
else
sprintf('The minimum point(x,y) is (%d, %d)', double(ptx(r1)),double(pty(r1)))
T3=subs(subs(f,x,ptx(r1)),y,pty(r1))
sprintf('The value of the function is %d', double(T3))
plot3(double(ptx(r1)),double(pty(r1)),double(T3),'m*','markersize',30);
end
end
end
```

Command Window

```
Enter the function f(x,y):
2*x^3+x*y^2+5*x^2+y^2
fx =
6*x^2 + 10*x + y^2
fy =
2*y + 2*x*y
ax =
   0
  -1
  -1
-5/3
ay =
 0
-2
 2
 0
fxx =
12*x + 10
D =
- 4*y^2 + (2*x + 2)*(12*x + 10)
a1 =
     0
a2 =
   -1.6667
b1 =
     2
b2 =
    -2
T1 =
20
T2 =
10
ans =
    'The minimum point(x,y) is (0, 0)'
T3 =
0
ans =
    'The value of the function is 0'
T1 =
-16
T2 =
-2
T3 =
3
ans =
    'The point (x,y) is (-1,-2) a saddle point'
T1 =
-16
T2 =
-2
T3 =
3
ans =
    'The point (x,y) is (-1,2) a saddle point'
T1 =
40/3
T2 =
-10
ans =
    'The maximum point(x,y) is (-1.666667e+00, 0)'
T3 =
125/27
ans =
    'The value of the function is 4.629630e+00'
```