Matlab-7

Lagrangers Multiplier Method

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LAGRANGERS MULTIPLIER METHOD

Experiment 7 (26/09/2016)

Aim:

(1) Find the maximum and minimum distances from the origin to the curve 3x2+4xy+6y2−140.
(2) Find the minimum of f(x,y) = x2 + y2 subject to the constraint x + y = 10.

New Commands:

jacobian(f,v): Computes the Jacobian of the scalar or vector f with respect to the vector v. The (i, j)-th entry of the result is df(i)/dv(j). Note that when f is scalar, the Jacobian of f is the gradient of f. Also, note that scalar v is allowed, although this is just diff(f, v).

ezmesh(f): plots a graph of f(x,y) using MESH. Works similar to ezsurf without colormap.

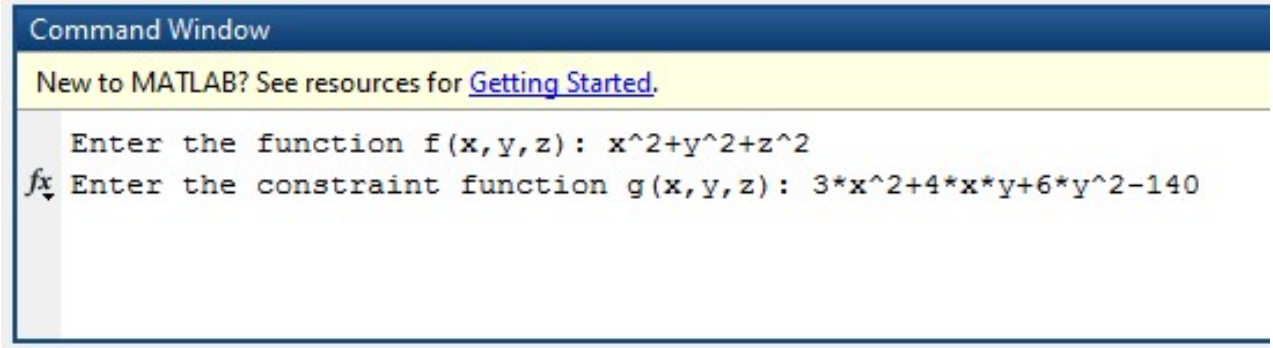
get(H,'X'): returns the value of the specified property (X) for the graphics object with handle H.

For part (1):

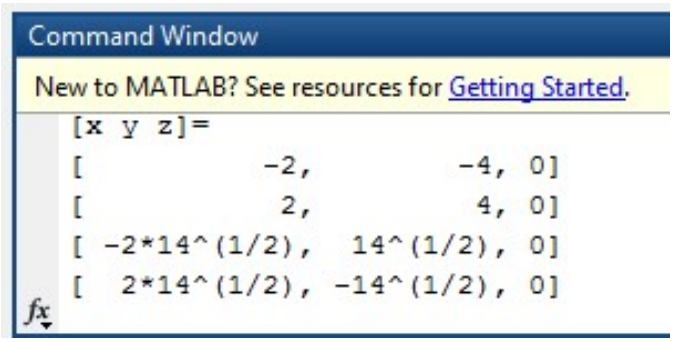
The code:

```
clc
clearvars
syms x y z L
f = input('Enter the function f(x,y,z): ');
g = input('Enter the constraint function g(x,y,z): ');
F = f + L*g;
gradF = jacobian(F,[x,y,z]);
[L,x1,y1,z1] = solve(g,gradF(1),gradF(2),gradF(3));
Z = [x1 y1 z1];
disp('[x y z]=')
disp(Z)
```

Input:



Output:



For part (2):

The code:

```
clc
clearvars
syms x y L
f = input('Enter the function f(x,y): ');
g = input('Enter the constraint function g(x,y): ');
F = f + L*g;
gradF = jacobian(F,[x,y]);
[L,x1,y1] = solve(g,gradF(1),gradF(2),'Real',true); % Solving only for Real x
and y
x1 = double(x1); y1 = double(y1);
xmx = max(x1); xmn = min(x1); % Finding max and min of x-coordinates for plot
range
ymx = max(y1); ymn = min(y1); % Finding max and min of y-coordinates for plot
range
range = [xmn-3 xmx+3 ymn-3 ymx+3]; % Setting plot range
ezmesh(f,range);hold on; grid on;
h = ezplot(g,range); set(h,'LineWidth',2);
tmp = get(h,'contourMatrix');
xdt = tmp(1,2:end); % Avoiding first x-data point
ydt = tmp(2,2:end); % Avoiding first y-data point
zdt = double(subs(f,{x,y},{xdt,ydt}));
plot3(xdt,ydt,zdt,'?r','LineWidth',2);axis(range);
for i = 1:numel(x1)
G(i) = subs(f,[x,y],[x1(i),y1(i)])
plot3(x1(i),y1(i),G(i),'*k','MarkerSize',20);
end
title('Constrained Maxima/Minima')
```

Input:

```
Command Window
New to MATLAB? See resources for Getting Started.
Enter the function f(x,y): x^2+y^2
Enter the constraint function g(x,y): x+y-10
```

Output:

```
Command Window
New to MATLAB? See resources for Getting Started.
G =
50
>>
```

The graph: