MIDTERM - Exercise 2

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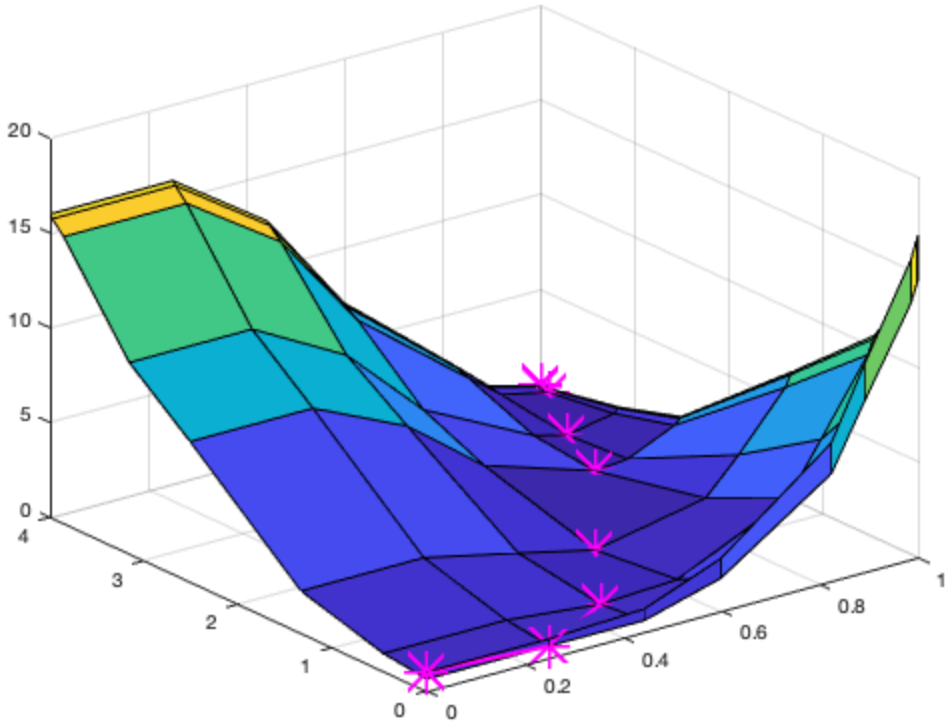
(2.4)

```
clc
clear

%Initialization
syms x y
f = (y - 4 * x^2)^2 + (1 - x)^2;
f_handle = matlabFunction(f);
x_0 = [0;0];
tol = 10^-8;
delta_max = 2;
delta_0 = 1;
eta = 0.2;
max_itr = 1000;

%Trust region
[xvec, zvec, rvec] = TR(f, x_0, tol, delta_max, delta_0, eta,
 max_itr);

%Plot
figure
surf(xvec(1,:), xvec(2,:), zvec)
hold on
plot3(xvec(1,:), xvec(2,:), f_handle(xvec(1,:),xvec(2,:)),'-
*','Color','m','MarkerSize',20, 'LineWidth', 2)
hold off
```



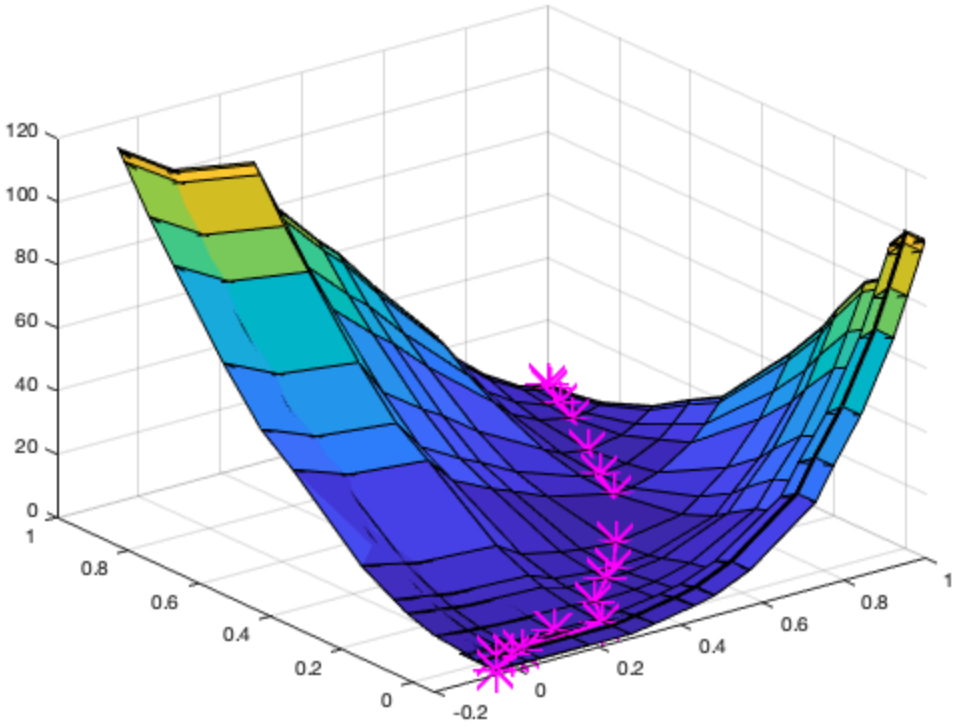
(2.5)

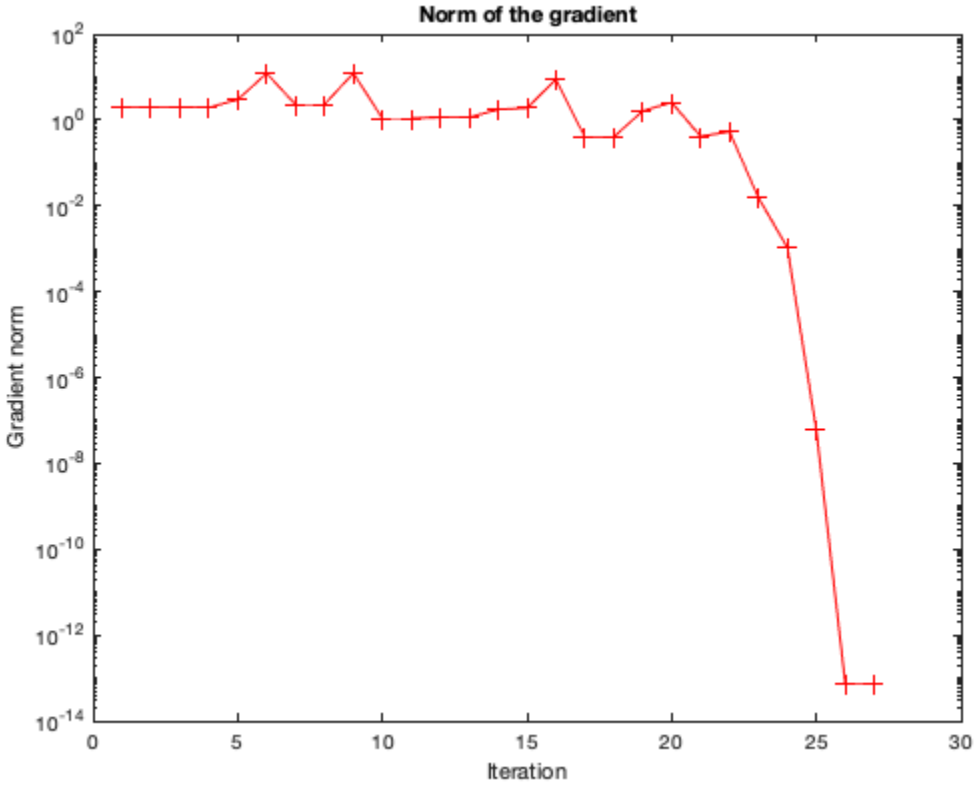
```
%Initialization
f_ros = (1 - x)^2 + 100 * (y - x^2)^2;
f_ros_handle = matlabFunction(f_ros);

%Trust region
[xvec_r, zvec_r, rvec] = TR(f_ros, x_0, tol, delta_max, delta_0, eta,
 max_itr);

%Plot
figure
surf(xvec_r(1,:), xvec_r(2,:), zvec_r)
hold on
plot3(xvec_r(1,:), xvec_r(2,:),
 f_ros_handle(xvec_r(1,:),xvec_r(2,:)),'-
*','Color','m','MarkerSize',20, 'LineWidth', 2)
hold off

figure
semilogy(rvec, '-r+');
xlabel('Iteration');
ylabel('Gradient norm');
s = sprintf('Norm of the gradient');
title(s)
```


120
100
80
60
40
20
0
1
0.8
0.6
0.4
0.2
0
-0.2
0
0.2
0.4
0.6
0.8
1


Norm of the gradient
Gradient norm
Iteration
10^{2}
10^{0}
10^{-2}
10^{-4}
10^{-6}
10^{-8}
10^{-10}
10^{-12}
10^{-14}
0
5
10
15
20
25
30

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