

**INSTITUTO TECNOLÓGICO DE ESTUDIOS SUPERIORES DE MONTERREY
CAMPUS ESTADO DE MÉXICO**



**Tecnológico
de Monterrey**

**Applied Computer Science
Masters in Nanotechnology**

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Optimization

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Due date: April 11, 2019, 15:59PM

MATLAB Script and Implemented Functions

```

% *****
% * AUTHOR(S) :
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% *
% * FILENAME :
% *      HW01.m
% *
% * DESCRIPTION :
% *      Computación Aplicada (Ene 19 Gpo 1)
% *      Homework on Optimization
% *
% * NOTES :
% *
% *
% * START DATE :
% *      10 Apr 2019
% *****

warning('off')
clc;
clear all;
close all;

%% *****
% Problem 1:
% Solve the following problem using the optimization toolbox:
%
%
%      /
%      |
%      | 2      4 \
% min f(x) = | 4 - 2.1 x_1 + --- | x_1  + x_1 x_2 + (- 4 + 4 x_2 ) x_2
% x      \      3 /
%
% for
% x_1 >= -3; x_1 <= 3
% x_2 >= -2; x_2 <= 2
%
% Use function fmincon to solve the problem
% Upload to Blackboard a pdf file that contains a MATLAB script, any MATLAB
% functions that you implemented, and required results.

fun = @(x) (4 - 2.1*x(1)^2 + x(1)^4/3)*x(1)^2 + x(1)*x(2) + (- 4 +
4*x(2)^2)*x(2)^2;
x0 = [-3,-2];
x = fmincon(fun,x0,[],[],[],[],[-3 -2],[3 2]);
disp("Problem 1:");
disp(strcat("Find the minimum value starting from the point
[num2str(x0(1)),",",num2str(x0(2)),"]"));
disp(strcat("x_1 = ",num2str(x(1))));
disp(strcat("x_2 = ",num2str(x(2))));
disp(" ");

%% *****
% Problem 2:
% Using function fminsearch minimize Branin's function:
%
%
%      2      2
% f(x) = a (x_2 - b x_1 + c x_1 - r) + s (1 - t) cos(x_1) + s
%
% where

```

```

a = 1;
b = 5.1/(4*pi^2);
c = 5/pi;
r = 6;
s = 10;
t = 1/(8*pi);
%
% for
% x_1 >= -5; x_1 <= 10
% x_2 >= 0; x_2 <= 15
%
% Upload to Blackboard a pdf file that contains a MATLAB script, any MATLAB
% functions that you implemented, and required results.

fcnMin = @(x) a*(x(2) - b*x(1)^2 + c*x(1) - r)^2 + s*(1 - t)*cos(x(1)) + s;
x_guess = [rand*15-5 rand*15]';
xmin = fminsearch(fcnMin,x_guess);
disp("Problem 2:");
disp(strcat("Minimize the function with starting point
[,num2str(x_guess(1))',' ',num2str(x_guess(2))',' '"]);
disp(strcat("x_1 = ",num2str(xmin(1))));
disp(strcat("x_2 = ",num2str(xmin(2))));
disp(" ");

```

Results

Local minimum found that satisfies the constraints.

Optimization completed because the objective function is non-decreasing in feasible directions, to within the value of the optimality tolerance, and constraints are satisfied to within the value of the constraint tolerance.

<stopping criteria details>

Problem 1:

Find the minimum value starting from the point [-3,-2]

x_1 = -0.089842

x_2 = 0.71266

Problem 2:

Minimize the function with starting point [4.8361,0.53568]

x_1 = 3.1416

x_2 = 2.275