**INSTITUTO TECNOLÓGICO DE ESTUDIOS SUPERIORES DE MONTERREY**

**CAMPUS ESTADO DE MÉXICO**



**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:

%

% / 4 \

% | 2 x\_1 | 2 2 2

% 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 Braninï¿½s 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