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%Name: Aditya Vipradas
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%Homework 1 Problem 1.a
%clear screen
clc;

%Define the objective function
fun1 = @(x)(x(1)-x(2))^2 + (x(2)+x(3)-2)^2 + (x(4)-1)^2 + (x(5)-1)^2;

%Define the initial guess
x0 = [2 2 2 2 2];

%Define the equality constraints
Aeq = [1 3 0 0 0;0 0 1 1 -2;0 1 0 0 -1];
beq = [0; 0; 0];

%Define the inequality constraints
A = [];
b = [];

%Define the upper and lower bounds
lb = [-10 -10 -10 -10 -10];
ub = [10 10 10 10 10];

x = fmincon(fun1, x0, A, b, Aeq, beq, lb, ub);
fx = (x(1)-x(2))^2 + (x(2)+x(3)-2)^2 + (x(4)-1)^2 + (x(5)-1)^2;

str1 = sprintf('The function minimizes at \n x1 = %0.5f \n x2 = %0.5f \n x3 = %0.5f \n x4 =
%0.5f \n x5 = %0.5f', x(1),x(2),x(3), x(4), x(5));
disp(str1);
str2 = sprintf('\n The minimum function value is %0.5f',fx);
disp(str2);
```

```
Local minimum found that satisfies the constraints.

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



The function minimizes at
 x1 = -0.76744
 x2 = 0.25581
 x3 = 0.62791
 x4 = -0.11628
 x5 = 0.25581

 The minimum function value is 4.09302
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