## CS227 Assignment (15/11/23)

Name :- Nagesh R Desai Roll No :- 2201CS50

1. Q. Minimize 3x2 - 13xy + 7y 2 by SD Method with Initial Point (1,1)

```
unuuedz.m x _ +
      /MATLAB Drive/untitled2.m
       1
                syms x1 x2
           %nages...
%2201cs50
                %nagesh desai
                function_1 = 3*x1^2 - 13*x1*x2 + 7*x2^2;
               %the function we need to minimize funcx inline (function_1); %making this function operable
               funcx = inline(function_1);
               funcobjec = @(x) funcx(x(:,1), x(:,2));
       8
               grad = gradient(function_1);
               gradfuncx =inline(grad);
               Hess1= hessian (function 1);
      10
      11
               Hessx=inline (Hess1);
               x0 = [1 1]; % initial value
               maxiter =3; % maximum number of iterations
      13
               tolerance = 5e-3; %tolerance to check
      14
               iterator =0;
      15
               X=[]; %vector to save next data
      16
      17
                gradx= @(x) gradfuncx(x(:,1), x(:,2));
      18 ☐ while norm (gradx(x0)) > tolerance && iterator< maxiter
      19
                X= [X:x0]:
      20
                Step_length = -gradx(x0);
                H = Hessx(x0);
                lambda = Step_length' *Step_length./(Step_length'*H*Step_length); %getting the optimum lambda
      22
                Xnew = x0+ lambda.*Step_length';
      23
      24
      25
                iterator = iterator +1; %looping
      26
                end
      27
                fprintf("The optimum Solution is = [%f, %f] n", x0(1), x0(2));
                fprintf("The optimum value of f(x) is= %f \n", funcobjec (x0));
      28
```

```
The optimum Solution is = [3.172012, 1.661530]
The optimum value of f(x) is= -19.005354
```

2. Q. Minimize  $8x - y + 5x^2 + 22xy + y^2$  by SD Method with Initial Point (0,0)

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```
untitled2.m ×
/MATLAB Drive/untitled2.m
          %nagesh desai
          %2201cs50
 3
          function_1 = 8*x1 - x2 + 5*x1^2 + 22*x1*x2 + x2^2;
 4
 5
          %the function we need to minimize funcx inline (function_1); %making this function
          funcx = inline(function_1);
 7
          funcobjec = @(x) funcx(x(:,1), x(:,2));
          grad = gradient(function_1);
 8
          gradfuncx =inline(grad);
 9
          Hess1= hessian (function_1);
10
          Hessx=inline (Hess1);
11
          x0 = [1 1]; % initial value
12
13
          maxiter =3; % maximum number of iterations
          tolerance = 5e-3; %tolerance to check
14
          iterator =0;
15
          X=[]; %vector to save next data
16
          gradx= @(x) gradfuncx(x(:,1), x(:,2));
17
          while norm (gradx(x0)) > tolerance && iterator< maxiter
18
19
          X= [X;x0];
20
          Step_length = -gradx(x0);
          H = Hessx(x0);
21
          lambda = Step_length' *Step_length./(Step_length'*H*Step_length); %getting the opti
22
          Xnew = x0+ lambda.*Step_length';
23
24
          x0 =Xnew;
25
          iterator = iterator +1; %looping
26
27
          fprintf("The optimum Solution is = [%f, %f] \n", x0(1), x0(2));
          fprintf("The optimum value of f(x) is= %f \n", funcobjec (x0));
28
```

```
>> untitled2
The optimum Solution is = [0.162041, -0.479276]
The optimum value of f(x) is= 0.428024
X =

1.0000    1.0000
-0.4801    0.1490
-0.0490    -0.6006
```