Homework 02

Problem 1

Consider using a gradient algorithm to minimize the function . With the initial guess as

* 1. To initialize the line-search apply bracketing procedure along the line starting at in the direction of negative gradient. Use = 0.075
  2. Apply the golden section method to reduce the width of uncertainty region to 0.01. Organize results of your computation in table format.
  3. Repeat the above using Fibonacci method.

Problem 2

For the function  
f(x1, x2) = (x2 - x1)4 + 12x1x2 - x1 + x2 - 3,

1. Use MATLAB’s commands meshgrid and mesh to generate its 3D plot. The range of  
   x1 and x2 is the same and it should be equal to [-1, 1]. Set the box on.

A close up of a map

Description automatically generated

Fig 1. 3D plot of the function using the mesh function in MATLAB

1. Use the command contour to generate 20 contours. Use the same range for x1 and x2  
   as in (a).

A picture containing table

Description automatically generated

Fig 2. Contours of the function generated in MATLAB

Problem 3

Minimize the above function using the method of the gradient descent when α = 0.02 and  
locate these points on the level sets of f. Connect the successive points with lines or lines  
with arrows to show clearly the progression of the optimization process. Use two staring  
points,  
 and

Obtain the sequence of points using the steepest descent method and locate these points on  
the level sets of fA picture containing table

Description automatically generated

Fig 3. The sequence of points plotted on level set of the function for starting point [0.55, 0.7]T

A picture containing indoor, table

Description automatically generated Fig 4. The sequence of points plotted on level set of the function for starting point [-0.9,-0.5]T

Problem 4

Minimize the above function using Newton’s method. Locate the points on Level sets of f.