

ECE592-084: Optimizations and Algorithms

Fall 2019

Prof. Shih-Chun Lin

Homework 2

Due: 11:59pm, Tuesday, October 15, 2019

Clearly identify the steps you have taken to solve each problem. Your grade depends on the completeness and clarity of your work as well as the resulting answer.

1. Exercise 7.12, page 129 from Textbook.
2. For the function

$$f(x_1, x_2) = (x_2 - x_1)^4 + 12x_1x_2 - x_1 + x_2 - 3,$$

- (a) use MATLAB's commands `meshgrid` and `mesh` to generate its 3D plot. The range of x_1 and x_2 is the same and it should be equal to $[-1, 1]$. Set the `box` on.
 - (b) use the command `contour` to generate 20 contours. Use the same range for x_1 and x_2 as in (a).
3. Minimize the above function using the method of the gradient descent when $\alpha = 0.02$ 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 starting points,

$$\mathbf{x}^{(0)} = \begin{bmatrix} 0.55 \\ 0.7 \end{bmatrix} \quad \text{and} \quad \mathbf{x}^{(0)} = \begin{bmatrix} -0.9 \\ -0.5 \end{bmatrix}.$$

Obtain the sequence of points using the steepest descent method and locate these points on the level sets of f .

4. Minimize the above function using Newton's method. Locate the points on the level sets of f .