

EE/CPE/NIS 608 Practice Exam 1

For all the following problems upload your source code (Python or Matlab) along with the solution.

1. Implement the gradient descent algorithm to solve the following problem. Plot the following: (a) iteration versus the function value for the first few iterations and (b) computed gradient at each iteration. What is the minimizer and the minimum of the function? State the initialization parameters and the stopping criterion you used.

$$\min_{x_1, x_2} \frac{1}{2} ([x_1 - 1]^2 + [x_2 - 3]^2)$$

2. Implement the penalty function method to solve the following problem. Use the quadratic penalty function, i.e., if constraint is $c(x) \leq 0$ penalty function is $\max(0, c(x))^2$. State all the parameters such as initialization, stopping criterion, etc. you used. Plot the iteration vs. the function value for the first few iterations.

$$\min f(x) = \frac{50}{x}, \quad x \leq 10$$

3. Implement the logarithmic barrier function method to solve the following problem. State all the parameters such as initialization, stopping criterion, etc. you used. Plot the iteration vs. the function value for the first few iterations.

$$\min \frac{1}{2}(x_1 - 3)^2 + (x_2 - 2)^2, \tag{1}$$

$$-2x_1 + x_2 \leq 0 \tag{2}$$

$$x_1 + x_2 \leq 4 \tag{3}$$

$$-x_2 \leq 0 \tag{4}$$