MA/OR/ST 706: Nonlinear Programming
Homework 1
Instructor: *Dr. Kartik Sivaramakrishnan*

INSTRUCTIONS

Due in class on Tuesday January 29, 2008. All problems are from the 2nd edition of Nocedal and Wright unless otherwise specified. Please read Chapter 2 in Nocedal and Wright before beginning the assignment. No late homeworks will be accepted without prior instructor approval.

1. Problem 2.1, Pages 27-28.
2. Problem 2.2, Page 28.
3. Problem 2.3, Page 28.
4. Problem 2.4, Page 28.
5. Problem 2.7, Page 28.
6. Problem 2.8, Page 28.
7. Problem 2.9, Page 29.
8. Consider the problem
$$\min_x \ ||Ax - b||^2$$
where A is an $m \times n$ matrix, b is an m dimensional vector, and the solution x is an n dimensional vector.
   (a) What is the first order necessary condition for optimality? Is it also a sufficient condition?
   (b) Is the optimal solution unique? Give reasons for your answer.
   (c) Can you give a closed form expression for the optimal solution? Specify any assumptions that you may need.
   (d) Solve the problem for
$$A = \begin{bmatrix} 2 & -1 & 0 \\ 0 & 2 & 2 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} \quad b = \begin{bmatrix} 2 \\ 6 \\ 2 \\ 0 \end{bmatrix}.$$