

C&O 367/CM 442 Nonlinear Optimization – Winter 2009

Assignment 3

Due date: Wednesday Feb. 11, 2009

Assignments are due before the start of class on the due date.
Write your name and ID# clearly, and underline your last name.

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1 Newton Method

Suppose that we seek to minimize the following function:

$$f(x_1, x_2) = -9x_1 - 10x_2 + \theta(-\ln(100 - x_1 - x_2) - \ln(x_1) - \ln(x_2) - \ln(50 - x_1 + x_2)),$$

where θ is a given parameter, on the domain

$$X = \{x : x_1 > 0, x_2 > 0, x_1 + x_2 < 100, x_1 - x_2 < 50\}.$$

1.1 Implementation

—— 10 Marks

Implement the pure Newton method on this problem (with step 1); then implement using a simple backtracking from the boundary of X . Run your algorithm for $\theta = 10$ and for $\theta = 100$, using the following starting points. (Output the current point and the distance to the optimum point. You can send the output by email to the instructor. Please include the MATLAB program.)

1. $x_0 = (8 \ 90)^T$
2. $x_0 = (1 \ 40)^T$
3. $x_0 = (15 \ 68.69)^T$
4. $x_0 = (10 \ 20)^T$

1.2 Implementation

—— 5 Marks

Explain the results/behaviour for the pure Newton method and the backtracking method, e.g. did you get convergence, why or why not? did you get quadratic convergence?

2 Problem 1, Text, Page 128

—— 12 Marks

3 Problem 11, Text, Page 130

—— 5 Marks