Problem Set 7

Due: Thursday, November 6, 2014

Readings: Nonlinear Programming class notes.

Problem 1

Find minima of the function:

$$f(\mathbf{x}) = (x_2^2 - x_1)^2,$$

among all the points satisfying necessary conditions for an extremum.

Problem 2

Consider the problem

$$\begin{array}{ll} \min & f(x) = x_1 + x_2 \\ \text{s.t.} & h_1(x) = (x_1 - 1)^2 + x_2^2 - 1 = 0 \\ & h_2(x) = (x_1 - 2)^2 + x_2^2 - 4 = 0 \end{array}$$

Find the local minimum. Do Lagrange multipliers exist ?

Problem 3

Consider the following problem

$$\begin{array}{ll} \min & (x_1 - \frac{9}{4})^2 + (x_2 - 2)^2 \\ \text{s.t.} & x_2 - x_1^2 \geq 0 \\ & x_1 + x_2 \leq 6 \\ & x_1, x_2 \geq 0 \end{array}$$

a) Write the Kuhn-Tucker optimality conditions and verify that they are satisfied at $\bar{\mathbf{x}} = (3/2, 9/4)$.

b) Show that $\bar{\mathbf{x}}$ is a global optimal solution.