Homework CAO – Series B, October, 2010

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Due: Turn in your solutions by November 3 at 6 p.m. (email) or turn them in postmarked by the date of 3-11 or earlier. You can also turn them in on 1-11 in class. Make precisely four out of the six problems below (you may choose them yourself).

Problem 1. Exercise 3.2 in "On Subdifferential Calculus".

Problem 2. Consider the following optimization problem: minimize $x_1^2 - x_1 + x_2^2 - 10x_2$ over all $x_1, x_2 \geq 0$ such that $x_1 \geq x_2 - 2$ and $2x_1 + 3x_2 \leq 11$.
a. Give a complete solution by means of the KKT-theorem after choosing a suitable model. In addition, verify the correctness of your answer by means of a figure.
b. Formulate the Lagrangian dual of this problem and determine if it has any solution/solutions.

Problem 3. Let $f(x_1, x_2) := \exp(x_1 + x_2^2)$.
a. Demonstrate: f is convex on $\mathbb{R}^2$.
b. Calculate explicitly the function f^*.
c. Calculate explicitly the function f^{**} and check that it is equal to f.

Problem 4. Exercise 1.2 in "Lagrangian duality and perturbational duality I".

Problem 5. Exercise 2.1 in "Lagrangian duality and perturbational duality I".

Problem 6. Exercise 4.1 in "Lagrangian duality and perturbational duality I".