

Math 4553, Homework 4, Due on 3/28/2014

1. (14 points) Write down the dual problem for

$$\begin{aligned} \min \quad & f = -x_1 + 2x_2 + 4x_3 + 2x_4 \\ \text{subject to} \quad & x_1 + 2x_2 - x_3 + x_4 \geq 0 \\ & -4x_1 - 3x_2 - 4x_3 + 2x_4 \geq -3 \\ & -x_1 - x_2 + 2x_3 + x_4 = 1 \\ & x_2, x_3, x_4 \geq 0 \end{aligned}$$

Then solve the problem using the simplex method. Write down the solution for both the primal and the dual problem.

2. (6 points) Express the following quadratic function in the form of $f = \frac{1}{2}\mathbf{x}^t Q \mathbf{x}$.

$$f = -\frac{x_1^2}{2} - x_2^2 + 3x_1x_2 - 5x_3^2 - 2x_1x_4 - x_2x_4 + x_3x_4 - 15x_4^2$$

Find ∇f and $\nabla^2 f$.