Homework 3

Keep digesting … solve on your own … write down your solutions explicitly … give explanations … so: be prepared for the final exam ☺.

Task 1 Inequality Constraints

This is an extension of what we did so far in class. The constraints are no longer equalities but inequalities. This task helps you to study the new situation.

First, please, read the first two pages of chp. 4 (*Convex optimization problems*) in Boyd's book. Then solve the problem, below:

minimize $f_0(x_1, x_2)$

subject to
$$\begin{array}{rcl} 2x_1 + x_2 & \geq & 1 \\ x_1 + 3x_2 & \geq & 1 \\ x_1 & \geq & 0 \\ x_2 & \geq & 0 \end{array}$$

Start by making a sketch of the feasible set.

Now, for each of the following objective functions, give set optimal set (i.e. all the points from the feasible set that minimize f_0) and the optimal value (i.e. the infimum of f_0 itself – over the feasible set).

a) $f_0(x_1, x_2) = x_1 + x_2$.
b) $f_0(x_1, x_2) = -x_1 - x_2$
c) $f_0(x_1, x_2) = x_1$
d) $f_0(x_1, x_2) = x_1^2 + 9x_2^2$

General arguments are fine for parts a,b,c. Use Lagrange techniques for part d.