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# CSC 284/484 Advanced Algorithms - homework 6

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- EXAM 3 (Thursday, April 14th) will contain some of the problems listed below (plus the problems for the string matching and number theory parts).
- Do solve the problems but do NOT turn your solutions in (we will use a problem session as a feedback mechanism).
- IMPORTANT: print this sheet, write your name on it, mark the problems you solved, and hand me the sheet before EXAM 3.

## Main Topic (linear programming):

CLRS exercises: 29.2-7, 29.4-1, 29.4-6.

CLRS problem: 29-1, 29-2.

Ferguson exercises (page-exercise number): 14-1, 14-2, 14-4, 39-3 (try to solve the exercises before looking at the answers).

**6.1** We are given  $n$  pairs of real numbers  $(x_1, y_1), \dots, (x_n, y_n)$ . We want to find real numbers  $a, b$  which minimize

$$\sum_{i \in \{1, \dots, n\}} |ax_i + y_i - b|.$$

Write a linear program for this problem. (Hint: if  $x, y$  are variables,  $y$  occurs exactly in the following two constraints  $y \geq x, y \geq -x$ , and  $y$  occurs in the objective (that is minimized) with a positive coefficient then in the optimal solution one has  $y = |x|$ .)

**6.2** We are given  $n$  pairs of real numbers  $(x_1, y_1), \dots, (x_n, y_n)$ . We want to find real numbers  $a, b$  which minimize

$$\max_{i \in \{1, \dots, n\}} |ax_i + y_i - b|.$$

Write a linear program for this problem.

**6.3** We are given  $n$  pairs of real numbers  $(x_1, y_1), \dots, (x_n, y_n)$ . We want to find real numbers  $a, b$  which minimize

$$\sum_{i \in \{1, \dots, n\}} (ax_i + y_i - b)^2.$$

Find a formula for  $a$  and  $b$  (you do NOT need linear programming for this one).