

MATP6640/DSES6770 Linear Programming, Homework 5.

Due: Monday, March 31, 2008.
10% penalty for each day late.

1. Consider the standard form linear programming problem $\min\{c^T x : Ax = b, x \geq 0\}$. Assume A is an $m \times n$ matrix of rank m . Let $\mu > 0$ and let x be a given strictly feasible solution. Let X denote the diagonal matrix with $X_{ii} = x_i$ for $i = 1, \dots, n$. Let y^*, s^* solve the problem $\min\{\|Xs - \mu e\|^2 : A^T y + s = c\}$, where e denotes the vector of ones. Find y^* and s^* . Show that if the optimal value is smaller than μ^2 then $s^* > 0$; what can you conclude about the set of optimal primal solutions in this situation?
2. Consider the LP:

$$\begin{array}{llllll} \max & 17y_1 & + & y_2 & & \\ \text{s.t.} & y_1 & + & 3y_2 & \leq & 3 \\ & y_1 & - & y_2 & \leq & 3 \\ & y_1 & + & y_2 & \leq & 2 \\ & & & y_i & \geq & 0 \quad i = 1, \dots, 2 \end{array}$$

Show that $y = (1, -1)$ is on the central trajectory for this problem.

3. (Wright, Chapter 2, Question 6, page 47.) Construct standard form linear programs with $n \leq 3$ and
 - (a) $\mathcal{B} = \emptyset$
 - (b) $\mathcal{B} = \{1, \dots, n\}$.

The **Midterm Exam** will take place on Thursday, April 3rd, in class. You may bring one sheet of handwritten notes (you can write on both sides). No calculators are allowed. It will cover all material covered in class up to March 31. Material from old midterm exams will be placed on the course website.

John Mitchell
Amos Eaton 325
x6915.

mitchj at rpi dot edu

Office hours: Mondays, 1pm – 2pm. Thursdays, 1pm – 3pm.