CS 525 - Fall 2011 - Homework 3[*]

assigned 9/21/11 - due 9/28/11

Hand in an annotated diary file, constructed as outlined in the MATLAB Setup handout and in Homework 1.

1. The ℓ_∞ norm of a vector z is given by

$$\|z\|_\infty = \max_{1 \le i \le m} |z_i|.$$

The ℓ_1 norm of a vector is given by

$$\|z\|_1 = \sum_{i=1}^{m} |z_i|.$$

Reformulate the following optimization problems as linear programs in standard form, that is, all variables are nonnegative variables and all general constraints are $\ge$ constraints.

(a)
$$\text{minimize} \quad \|Ax - b\|_\infty$$

x is the variable and it is free. A is $m \times n$, b is $m \times 1$, x is $n \times 1$.

(b)
$$\begin{aligned}
\text{maximize} \quad & c'x \\
\text{subject to} \quad & \|x\|_1 \le \delta \\
& Ax = b
\end{aligned}$$

x is the variable and it is free. A is $m \times n$, b is $m \times 1$, x is $n \times 1$, and δ is a constant.

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[*]Hard copy to be submitted **in class** on the due date. No late homework accepted.

2. We would like to construct a quadratic polynomial

$$p(x) = a_0 + a_1 x + a_2 x^2$$

with the properties that $p(0) \leq 1$, $p(1) \geq 1$, all of the coefficients are between -2 and 2, and $p(1/2)$ is as large as possible. Write this problem as a linear program in standard form where the variable is the vector of coefficients (a_0, a_1, a_2).

3. Do exercise 3-1-2.

4. Do exercise 3-2-1.

5. Do exercise 3-3-2.

6. Do exercise 3-3-7.