AMSC 607 / CMSC 878o Fall 2003

HMWK 3: Due December 11

Show all work.

All work must be your own (i.e., no group efforts are allowed).

If you use a reference book, cite it, or you will lose credit!

Your 3rd and final homework assignment, worth 25 points, will compare two algorithms for solving linear programming problems.

Suppose the problem is

$$\min_x c^T x$$

$$Ax = b$$

$$x \geq 0$$

where $x \in \mathcal{R}^n$ and $b \in \mathcal{R}^m$ with $m < n$.

We will assume a constraint qualification.

You will write Matlab programs for two methods:

- the Simplex method for linear programming.
- an interior point method.

To write the Simplex algorithm: Use the algorithm that you developed in the Unquiz. Assume that someone gives you a starting point that is a vertex. Use `qrupdate` to update a factorization of the basis matrix.

For the interior point method: implement the algorithm on p. 582 of your text. Use `qr` to solve the least squares problem (or linear system) at each iteration.

Grading:

- 7 points for the efficient implementation of each of the algorithms as a bug-free Matlab function, with well-documented calling sequence and algorithm.
- 5 points for the output of testing each of your algorithms on the problem on p.285 of your text. Use the the problem in standard form (with slack variables).
  - Start the Simplex algorithm at the point $[0, 0, 2, 7, 3]^T$
  - Start the IPM at the point $[.5, .5, 2.5, 6.5, 1.5]^T$.

  Print your sequence of iterates.
- 6 points for a count of the work per iteration (in terms of m and n) for the Simplex method and the IPM.