Homework 2, Due Thursday, March 6th

February 23, 2008

Reminder.
Midterm I on Thursday, March 13;
Midterm II on Tuesday, March 25;
Standard time and location: room 106, Scott Hall, 7.40 pm.

Problem 1 (30 points). For the linear constraints

$x + y \geq 3$
$3y - 5x \leq 15$
$5x + 2y \geq 10$
$x \geq 0, y \geq 0$

Draw the set of all feasible vectors and find:
a) All extreme points (vertices);
b) All degenerate extreme points;
c) All basic feasible pairs of inequalities and the corresponding basic feasible solutions;
d) All non-basic pairs of inequalities;
e) All basic infeasible pairs of inequalities and the corresponding vectors.

Find all optimal solutions for the following LP problems:
maximize x, minimize x,
maximize y, minimize y,
maximize $x + y$, minimize $x + y$,
maximize $2x + y$, minimize $2x + y$
maximize $5x - 3y$, minimize $5x - 3y$,
subject to the above constraints.

Problem 2 (35 points). For the linear constraints

$x + y + z \leq 5$
$15x + 10y + 12z \leq 60$
$22x + 18y \leq 99$
$x \geq 0, y \geq 0, z \geq 0$

Draw the set of all feasible vectors and find:
a) All extreme points (vertices);
b) All degenerate extreme points;

c) All basic feasible triplets of inequalities and the corresponding basic feasible solutions;

d) All non-basic triplets of inequalities;

e) All basic infeasible triplets of inequalities and the corresponding vectors.

Find all optimal solutions for the following LP problems:
maximize x, minimize x,
maximize y, minimize y,
maximize z, minimize z,
maximize $x + 3y$, minimize $x + 3y$,
maximize $2x + z$, minimize $2x + z$
maximize $x + y + z$, minimize $x + y + z$,
maximize $x + 3y + 5z$, minimize $x + 3y + 5z$,
maximize $11x + 9y$, minimize $11x + 9y$,
subject to the above constraints.

Problem 3 (25 points).
A polyhedron P is defined by a system S of m linear constraints in $\mathbb{R}^n$.
For $m = 6, n = 2$, for $m = 3, n = 3$, for $m = 4, n = 3$, and for $m = 5, n = 3$
a) How many vertices can be in P ?
b) How many degenerate vertices can be in P?
c) How many non-basic subsystems can be in S ?