

Homework 5, Due: October 14, 2009

No conference session on Tuesday, October 13 and turn in this homework in class on Wednesday

Problem 1 (10 points) Consider the polyhedron

$$P = \{x : Ax = b \quad c \leq x \leq d\}$$

where c and d are two vectors in R^n . Let \hat{x} be a feasible point in P , what is the feasible-direction cone of P at \hat{x} ? Justify your answer.

Problem 2 (30 points) Consider the following linear program

$$\begin{array}{ll} \min & x_1 - x_2 + 3x_3 - 5x_4 \\ \text{s.t.} & 4x_1 - x_2 + x_3 = 8 \\ & -2x_1 + 3x_2 + x_4 = 6 \\ & x_i \geq 0, \quad (i = 1, \dots, 4) \end{array}$$

- (a) Find all the vertices of the feasible region of the problem.
- (b) For each vertex, find its basic directions (the generators of the feasible-direction cone at the vertex).
- (c) For each vertex, find its reduced costs and determine if the vertex is an optimal solution.