C&O 350
Assignment 2

Due: Wed. Feb 1 (§2, §3), Thurs. Feb 2 (§1)

1. Chvatal, Problem 3.9 a,b,c, page 44.

2. Read Chapter 4 in Chvatal. Then reproduce the Klee-Minty cycling example on pages 47,48,49 by using the matlab package (lpmovie) on the computer. Capture your output using the diary command and hand in a copy with your assignment.

3. Let $F \subset \Re^5$ be the set of x satisfying

$$\begin{array}{rcrcrcrcrcl} 2x_1 & - & x_2 & + & 5x_3 & + & x_4 & & & = & 4 \\ -x_1 & + & x_2 & - & 3x_3 & & & + & x_5 & = & -2 \\ & & & & & & & & x_j \geq 0, & & \forall j \end{array}$$

   For each of the following three cases, state whether or not the point $\bar{x}$ is a basic feasible solution. In each case, if $\bar{x}$ is a basic feasible solution, exhibit a corresponding dictionary, and if not, find a nonzero vector $d \in \Re^5$ with both $\bar{x}+d$ and $\bar{x}-d$ in F.

   (a)

$$\bar{x} = (0\ 1\ 1\ 0\ 0)^T.$$

   (b)

$$\bar{x} = (\frac{1}{2}\ 0\ \frac{1}{2}\ \frac{1}{2}\ 0)^T.$$

   (c)

$$\bar{x} = (2\ 0\ 0\ 0\ 0)^T.$$

4. Consider the LP

$$\begin{array}{rl} \min & cx \\ \text{subject to} & Ax = b \\ & x \geq 0 \end{array}$$

   Suppose that this LP has a unique optimal solution. Show that this optimal solution is an extreme point of the feasible set. (Use the definition of extreme point given in the class.)