T-79.4201 **Spring 2006**

Search Problems and Algorithms

Tutorial 8, 31 March

Problems

1. Give the following linear program in the standard form:

$$\begin{array}{l} \max \;\; 2x_1 - 3x_2 + x_3 \quad \text{s.t.} \\ x_1 + x_2 \geq 2x_3 \\ 3x_2 - 4x_3 \leq x_1 \\ x_1 \geq 0 \\ x_2 \geq 0 \end{array}$$

2. Express the condition "if $y = 1$, then $x_1 + \cdots + x_n \geq 100$" as a linear constraint, where y is an integer variable such that $0 \leq y \leq 1$ and $x_i \geq 0$. Hint: employ a sufficiently large constant M.

3. Represent the constraints

$$\begin{array}{l} \frac{x}{x-y} \leq 2 \\ 2x - y \leq -1 \\ x \geq 0 \\ y \geq 0 \end{array}$$

   using purely linear constraints.

4. Represent the following constraints as linear constraints.

   (i) $|a_1x_1 + \cdots + a_nx_n| = 0$.

   (ii) $|a_1x_1 + \cdots + a_nx_n| \leq b$.

5. Represent the constraint $|x| \geq b$ as linear constraints where x is unrestricted in sign. Hint: employ an additional binary integer variable and a sufficiently large constant M.