T-79.4201 **Autumn 2007**
Search Problems and Algorithms
Tutorial 8, 15 November
Problems

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

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

2. Express the condition "if $y = 0$, then $x_1 + \cdots + x_n \leq 100$" as a linear constraint, where y is an integer variable such that $0 \leq y \leq 1$ and $0 \leq x_i \leq 1000$. Hint: employ a sufficiently large constant M.

3. Represent the constraints

$$\begin{aligned}
&\tfrac{x}{x-y} \leq 2 \\
&2x - y \leq -1 \\
&x \geq 0 \\
&y \geq 0
\end{aligned}$$

   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.