Optimization
WS 2012/13
Exercises 3

1. (PORTA – Polyhedron Representation Transformation Algorithm)
   Install the PORTA package and read the manpages [http://typo.zib.de/opt-long_projects/Software/Porta/](http://typo.zib.de/opt-long_projects/Software/Porta/).
   Given the following ILP:

   \[
   \begin{align*}
   \text{max} & \quad x_1 + x_2 + x_3 + x_4 \\
   \text{w.r.t.} & \\
   x_1 + x_2 + x_3 & \leq 2 \\
   x_1 + x_2 + x_4 & \leq 2 \\
   x_3 + x_4 & \leq 1 \\
   \end{align*}
   \]

   \(x_1, x_2, x_3, x_4 \text{ integral}\)

   (a) Solve the LP relaxation with a solver (e.g., lp-solve or our Clp demo program).
   (b) Generate all feasible integral points using program \texttt{vint} (PORTA package).
   (c) Transform the point representation into the halfspace representation using program \texttt{traf} (PORTA package).
   (d) Solve the resulting linear program again with your lp solver.

2. Branch and Bound

   \[
   \begin{align*}
   \text{max} & \quad 8x_1 + 11x_2 + 6x_3 + 4x_4 \\
   \text{w.r.t.} & \\
   5x_1 + 7x_2 + 4x_3 + 3x_4 & \leq 14 \\
   \end{align*}
   \]

   \(x_1, x_2, x_3, x_4 \in \{0, 1\}\)

   (a) Solve the LP relaxation with a solver.
   (b) Apply branch and bound to find the optimal solution to the ILP.