1 (10 points)**.** *Linear programs:* You and your friends are studying the following problem.

$$\begin{array}{lrrrcr} \text{maximize} & 5x_1 & -2x_2 & -3x_3 & & \\ \text{subject to} & x_1 & +x_2 & & \leq & 2 \\ & 2x_1 & +x_2 & -x_3 & \leq & 2 \\ & 3x_1 & -x_2 & -2x_3 & \leq & -3 \\ & x_1, & x_2, & x_3 & \geq & 0 \end{array}$$

(a) Your friend Alice claims the problem is infeasible. Without using the simplex method explain why she is incorrect.

(b) Your friend Bob claims the problem is unbounded. Without using the simplex method explain why he is incorrect, by showing that the optimal value can be no greater than -1.

(c) The following dictionary has been produced by solving a certain LP problem in standard form:

$$\begin{array}{rcrcrcrcr} s_1 & = & 3 & - & x_1 & - & x_3 & + & s_3 \\ x_2 & = & 12 & - & x_1 & - & 2x_3 & - & s_3 \\ s_2 & = & 4 & - & x_1 & + & x_3 & + & s_3 \\ z & = & 24 & - & x_1 & - & 3x_3 & - & 2s_3 \end{array}$$

Find the original LP problem in standard form.