Problem 46.7. Solve the following linear program (from Chvatal [40], Chapter 3, page 44) using the two-phase simplex algorithm:

$$\begin{aligned} &\text{maximize} && 3x_1 + x_2 \\ &\text{subject to} && \\ & && x_1 - x_2 \leq -1 \\ & && -x_1 - x_2 \leq -3 \\ & && 2x_1 - x_2 \leq 2 \\ & && x_1 \geq 0,\ x_2 \geq 0. \end{aligned}$$

Problem 46.8. Show that the following linear program (from Chvatal [40], Chapter 3, page 43) is unbounded.

$$\begin{aligned} &\text{maximize} && x_1 + 3x_2 - x_3 \\ &\text{subject to} && \\ & && 2x_1 + 2x_2 - x_3 \leq 10 \\ & && 3x_1 - 2x_2 + x_3 \leq 10 \\ & && x_1 - 3x_2 + x_3 \leq 10 \\ & && x_1 \geq 0,\ x_2 \geq 0,\ x_3 \geq 0. \end{aligned}$$

Hint. Try $x_1 = 0, x_3 = t$, and a suitable value for x_2.