

CSC373 Worksheet 6

August 12, 2020

1. **CLRS 29.1-4:** Convert the following linear program into standard form:

Minimize

$$2x_1 + 7x_2 + x_3$$

Subject to

$$x_1 - x_3 = 7$$

$$3x_1 + x_2 \geq 7$$

$$x_2 \geq 0$$

$$x_3 \leq 0$$

2. **CLRS 29.1-5:** Convert the following linear program into slack form:

Maximize

$$2x_1 - 6x_3$$

Subject to

$$x_1 + x_2 - x_3 \leq 7$$

$$3x_1 - x_2 \geq 7$$

$$-x_1 + 2x_2 + 2x_3 \geq 0$$

$$x_1, x_2, x_3 \geq 0$$

3. **CLRS 29.1-6:** Show the following linear program is infeasible:

Maximize

$$3x_1 - 2x_2$$

Subject to

$$\begin{aligned}x_1 + x_2 &\leq 2 \\ -2x_1 - 2x_2 &\leq -10 \\ x_1, x_2 &\geq 0\end{aligned}$$

4. **CLRS 29.1-7:** Show that the following linear program is unbounded:

Maximize

$$x_1 - x_2$$

Subject to

$$\begin{aligned}-2x_1 + x_2 &\leq -1 \\ -x_1 - 2x_2 &\leq -2 \\ x_1, x_2 &\geq 0\end{aligned}$$

5. **CLRS 29.1-8:** Suppose that we have a general linear program with n variables and m constraints, and suppose that we convert it into standard form. Give an upper bound on the number of variables and constraints in the resulting linear program.
6. **CLRS 29.1-9:** Give an example of a linear program for which the feasible region is not bounded, but the optimal objective value is finite.