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CSCI 5654
Homework 1

P1.

1. First change the problem into a maximization problem:

$$\text{minimize } 3x_1 - 5x_2 \Rightarrow \text{maximize } -3x_1 + 5x_2$$

2. Change the constraints to $\leq$:

$$4x_1 + x_2 \geq -4 \Rightarrow -4x_1 - x_2 \leq 4$$
$$2x_1 - x_2 \geq -8 \Rightarrow -2x_1 + x_2 \leq 8$$

3. Make sure the variables have non-negativity constraints:

$$x_2 \mapsto x_2^+ - x_2^-$$
$$x_2^+, x_2^- \geq 0$$

   Replace x_2 with $x_2^+ - x_2^-$ in the problem.

The problem can now be written in standard form as:

$$\begin{aligned} \textbf{maximize } & -3x_1 + 5x_2^+ - 5x_2^- \\ \textbf{s.t. } & -4x_1 - x_2^+ + x_2^- \leq 4 \\ & -2x_1 + x_2^+ - x_2^- \leq 8 \\ & x_1 + 2x_2^+ - 2x_2^- \leq 4 \\ & x_1, x_2^+, x_2^- \geq 0 \end{aligned}$$

P2.

P3.

P4.

P5.