Suggested Problems

Set 3

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Problem 1

Show that the following problems are bounded.

1. \textbf{maximize} \ 4x_1 + 2x_2 + 3x_3 \\
   \text{subject to} \\
   \quad x_1 + x_2 + x_3 \leq 5 \\
   \quad x_1, x_2, x_3 \geq 0 \\

2. \textbf{maximize} \ 4x_1 - 2x_2 + 3x_3 \\
   \text{subject to} \\
   \quad x_1 + x_2 + x_3 \leq 5 \\
   \quad x_1, x_2, x_3 \geq 0
Problem 2

Show that the following problems are unbounded.

1. \textbf{maximize} \quad 4x_1 + 2x_2 + 3x_3
   \text{subject to}
   \begin{align*}
   x_1 + x_2 - x_3 & \leq 5 \\
   x_1, x_2, x_3 & \geq 0
   \end{align*}

2. \textbf{maximize} \quad 3x_1 + x_2 + x_3 + x_4
   \text{subject to}
   \begin{align*}
   x_1 + x_2 & \leq 1 \\
   x_1 + x_3 & \leq 1 \\
   x_1 - x_4 & \leq 1 \\
   x_1, x_2, x_3, x_4 & \geq 0
   \end{align*}
Problem 3

Write the following dictionaries in the tableau format and pivot once.

1. \[ x_4 = 2 - x_1 - 3x_2 - x_3 \]
   \[ x_5 = 4 - x_1 + x_3 \]
   \[ x_6 = 10 - x_2 - 2x_3 \]
   \[ z = 7 + 2x_1 - x_2 - x_3 \]

2. \[ x_1 = 3 - x_2 + x_3 - x_5 \]
   \[ x_4 = 4 - x_3 \]
   \[ x_6 = 3 - x_2 - x_5 \]
   \[ z = 1 - x_2 + 2x_3 + x_5 \]

3. \[ x_1 = 4 - 2x_2 - x_3 + 2x_5 \]
   \[ x_4 = 5 - x_2 + x_3 - x_5 \]
   \[ x_6 = 4 + x_2 - x_3 + 2x_5 \]
   \[ z = 7 + 2x_2 - x_3 - x_5 \]