

Homework Assignment 2

Matthew Tiger

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Problem 1. Convert the following linear programming problem to *standard form*:

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

Solution.

□

Problem 2. Solve the system $Ax = b$ where

$$A = \begin{bmatrix} 2 & -1 & 2 & -1 & 3 \\ 1 & 2 & 3 & 1 & 0 \\ 1 & 0 & -2 & 0 & -5 \end{bmatrix}, \quad b = \begin{bmatrix} 14 \\ 5 \\ -10 \end{bmatrix}.$$

If possible, generate a non-basic feasible solution of the system from which you derive next a basic feasible one.

Solution.

□

Problem 3. Does every linear programming problem in standard form have a nonempty feasible set? If “yes”, provide a proof. If “no”, provide a counter-example.

Does every linear programming problem in standard form (assuming a nonempty feasible set) have an optimal solution? If “yes”, provide a proof. If “no”, provide a counter-example.

Solution.

□

Problem 4. a. Solve the following linear program graphically:

$$\begin{array}{ll}\text{maximize} & 2x_1 + 5x_2 \\ \text{subject to} & 0 \leq x_1 \leq 4 \\ & 0 \leq x_2 \leq 6 \\ & x_1 + x_2 \leq 8\end{array}$$

b. Solve the linear program in (b) the same way Example 15.15 was solved in class.
Compute only the vertices that lead to the optimal vertex found at (a).

Solution.

□