§6.7 (part 2): The Duality Theorem

1.] Consider the following LP:

$$\text{Maximize:} \qquad z = 2x_1 + 4x_2 + 4x_3 - 3x_4$$

$$\begin{aligned} \text{Subject to:} \quad x_1 + x_2 + x_3 \qquad &= 4 \\ x_1 + 4x_2 \qquad + x_4 &= 8 \\ x_1, x_2, x_3, x_4 &\geq 0 \end{aligned}$$

a.) Identify, from the primal problem, the vectors $\boldsymbol{c}$ and $\boldsymbol{b}$, and the matrix A.

b.) Suppose x_2 and x_3 comprise the optimal basis to the primal problem. Determine $\boldsymbol{c}_B$, B, and B^{-1}. Then, show that it is optimal by computing $\bar{c}_j$ for the non-basic variables.

c.) Write the dual problem.

d.) Find the optimal solutions to the primal and dual, and verify the Dual Theorem.