Homework 7
Due 3/01

1. State the dual of the max problem:

$$\begin{aligned} \max \quad & z = 10x_1 + 6x_2 + 7x_3 \\ \text{subject to} \quad & \\ & 5x_1 + 2x_2 + 3x_3 && \leq 100 \\ & 3x_1 + x_2 + x_3 && = 45 \\ & 2_x1 - 3x_3 && \geq 2 \\ & x_1 && \geq 0 \\ & x_2 && \geq 0 \\ & x_3 && \text{u.r.s} \end{aligned}$$

2. Solve the following LP using Dual Simplex.

$$\begin{aligned} \min \quad & z = 8x_1 + 6x_2 + 15x_3 \\ \text{subject to} \quad & \\ & x_1 + 2x_2 && \geq 5 \\ & x_1 + x_2 + x_3 && \geq 6 \\ & 2x_1 + x_3 && \geq 4 \\ & x_i && \geq 0 \qquad \forall i = 1, 2, 3 \end{aligned}$$

3. Suppose I have a maximization problem with 3 variables and 2 constraints. Let $x = \begin{bmatrix} 2 \\ 3 \\ 0 \\ 0 \\ 0 \end{bmatrix}$ be a feasible solution to the problem after adding the slack variables. Let $\pi = \begin{bmatrix} 1 & 4 & 0 & 2 & 0 \end{bmatrix}$ be a feasible solution to the dual problem after adding the slack variables. What can you say about the relation between z and w? (where z is the objective value obtained at x, and w the objective value of the dual at π).

4. Suppose I have a maximization problem with 3 variables and 2 constraints. Let $x = \begin{bmatrix} 0 \\ 3 \\ 2 \\ 0 \\ 0 \end{bmatrix}$ be a feasible solution to the problem after adding the slack variables. Let $\pi = \begin{bmatrix} 3 & 4 & 1 & 0 & 0 \end{bmatrix}$ be a feasible solution to the dual problem after adding the slack variables. What can you say about the relation between z and w? (where z is the objective value obtained at x, and w the objective value of the dual at π).