

## MATH 354: Homework 9

Due: March 31, 2022 at 11:00 am

1. Upcoming office hours are Monday March 28 3-4 pm and Thursday March 31 9-10 am.
2. Reading is Section 5.2 in Miller, or equivalently 3.1-2 in Kolman and Beck.
3. Write down the dual problem to Problem 6 from Homework 1, the book publisher problem. Then use the final tableau from the simplex method as applied to the original problem (from Homework 7 Problem 3) to determine the optimal solution and optimal value to the dual problem. What do the values for the variables that you found mean in terms of the original problem?
4. Write down the dual problem to Problem 4 from the sample midterm, the potato chips problem. Then use the final tableau from the simplex method as applied to the original problem (from Homework 7 Problem 4) to determine the optimal solution and optimal value to the dual problem. What do the values for the variables that you found mean in terms of the original problem?
5. Write down the dual problem to Problem 3 on Homework 8. Then change Phase II of your solution to this problem using the simplex algorithm so that it also generates the optimal solution to the dual problem.
6. Write down the dual to the following linear programming problem: Maximize  $z = 2x_1 + 3x_2 + x_3$  subject to

$$\begin{cases} x_1 - 5x_2 + x_3 \leq 3 \\ x_1 + x_3 \leq 7 \\ x_1, x_2, x_3 \geq 0 \end{cases}$$

What does this dual problem tell you about the optimal value of the original problem?

7. Give an example of a linear programming problem for which neither the primal problem nor the dual problem has feasible solutions. (Hint: You do not need many variables to do this.)