

# Assignment 6

Due Friday, April 5 at 11:59 pm.

*Please submit all work on Canvas as a PDF or Word file. Make sure you clearly label each solution, and include the answers to the in-class quiz at the beginning of the assignment.*

## Part 1: Setting Up Linear Programming Problems

**1) Woodworking** A woodworking shop makes two products, cabinets and tables. Each cabinet brings \$800 of profit, and each table brings \$500. The company's carpentry shop has a capacity of 120 hours per week. Its finishing shop has a capacity of 80 hours per week. Making each cabinet requires 20 hours of carpentry and 10 hours of finishing. Making each table requires 12 hours of carpentry and 10 hours of finishing. The company wishes to determine the product mix that maximizes profit.

- (a) **What are the decision variables? (2 points)**
- (b) **What is the objective? Write it out and explain what it means in words. (3 points)**
- (c) **What are the constraints? Write out the equations and explain what they mean in words. (4 points)**

**2) Protein Powder** In order to boost the effectiveness of your workouts, you decide to make protein shakes using protein powder. You aren't able to find one that provides the mix of protein and fiber that you're looking for, but you can mix two powders to get what you want. Vega One costs \$1.52 per ounce and has 20 grams of protein and 2 grams of fiber. Orgain costs \$1.30 per ounce and has 15 grams of protein and 5 grams of fiber. You want to find the cheapest mix that contains at least 18 grams of protein and 3 grams of fiber, and would like to use less than 1.5 ounces of protein powder at a time.

- (a) **What are the decision variables? (2 points)**
- (b) **What is the objective ? Write it out and explain what it means in words. (3 points)**
- (c) **What are the constraints? Write out the equations and explain what they mean in words. (4 points)**

## Part 2: Solving Linear Programming Problems

**3) Pizza and Calzones** A pizza vendor sells pizzas and calzones at a sporting event. Since it is very well attended, the vendor is certain all of their pizzas and calzones will sell out. Pizzas can be sold for a profit of \$3.00 and use 500 grams of dough, 300 grams of sauce, and 150 grams of cheese. Calzones can be sold for a profit of \$2.50 and use 750 grams of dough, 200 grams of sauce, and 250 grams of cheese. If the vendor has 112,500 grams of dough, 60,000 grams of sauce, and 36,000 grams of cheese, how many pizzas and calzones should they make?

- (a) What are the decision variables? (2 points)
- (b) What is the objective? (2 points)
- (c) What are the constraints? (2 points)
- (d) Graph the feasible region that satisfies all constraints. *If you take a picture rather than drawing it on the computer, make sure it clearly visible! If it is hard to read, you will lose points for this question!* (3 points)
- (e) Find the possible optimal solution points. These are the points where the lines intersect at the boundary of the feasible region. (6 points)
- (f) How many pizzas and calzones should they make? What is the profit they would make from this? (2 points)