

Math 170 Sections 5.1-5.2 Study Guide

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1 Section 5.1

Problem 1) Graph the following system of linear inequalities. Then, determine all the corner points.

$$3x + 2y \geq 6$$

$$3x - 2y \leq 6$$

$$x \geq 0$$

Problem 2) Graph the following system of linear inequalities. Then, determine all the corner points.

$$2x + 4y \geq 12$$

$$x \leq 5$$

$$y \leq 3$$

$$x \geq 0$$

$$y \geq 0$$

Problem 3) Graph the following system of linear inequalities. Then, determine all the corner points.

$$30x + 20y \leq 600$$

$$10x + 40y \leq 400$$

$$20x + 30y \leq 450$$

$$x \geq 0$$

$$y \geq 0$$

Problem 4) A college's math department offers two courses: Finite Math and Applied Calculus. Each section of Finite Math has 60 students, and each section of Applied Calculus has 50 students. The department is allowed to offer a total of up to 110 sections between the two classes. Furthermore, no more than 6000 students may take a math course. Set up the system of inequalities and draw the feasible region (solution set). Then identify the corner points.

Partial Solution: Here is the system of inequalities.

$$60x + 50y \leq 6000$$

$$x + y \leq 110$$

$$x \geq 0$$

$$y \geq 0$$

2 Section 5.2

Problem 5) Consider the following linear program:

$$\begin{aligned} \max \quad & x + y \text{ s.t.} \\ & x + 2y \leq 9 \\ & 2x + y \leq 9 \\ & x \geq 0 \\ & y \geq 0 \end{aligned}$$

In order to solve the linear program, you need to do the following.

- (a) Graph the inequalities and identify the feasible region.
- (b) Determine the corner points.
- (c) Plug the corner points into the objective function (the function you are trying to maximize/minimize; here, that is $x + y$).
- (d) Which of the corner points maximizes $x + y$? What is the maximum value $x + y$ obtains in the feasible region?

Problem 6) Solve the following linear program. That is, go through steps (a)-(d) outlined in Problem 5.

$$\begin{aligned} \max \quad & x + 2y \text{ s.t.} \\ & x + 3y \leq 24 \\ & 2x + y \leq 18 \\ & x \geq 0 \\ & y \geq 0 \end{aligned}$$

Problem 7) Solve the following linear program. That is, go through steps (a)-(d) outlined in Problem 5.

$$\begin{aligned} \min \quad & 3x + y \text{ s.t.} \\ & 10x + 20y \geq 100 \\ & 0.3x + 0.1y \geq 1 \\ & x \geq 0 \\ & y \geq 0 \end{aligned}$$

Problem 8) You manage an ice cream factory that produces two flavors: Creamy Vanilla and Continental Mocha. Into each quart of Creamy Vanilla goes 2 eggs and 3 cups of cream. Into each quart of Continental Mocha goes 1 egg and 3 cups of cream. You have in stock 500 eggs and 900 cups of cream. You make a profit of 3 on each quart of Creamy Vanilla and 2 on each quart of Continental Mocha. How many quarts of each flavor should you make in order to maximize profit?

Partial Solution: We set up the linear program. Afterwards, go through steps (a)-(d) outlined in Problem 5. Let x denote the quantity of Creamy Vanilla sold, and let y denote the quantity of Continental Mocha sold.

$$\begin{aligned} \max \quad & 3x + 2y \text{ s.t.} \\ & 2x + y \leq 500 \text{ (Eggs)} \\ & 3x + 3y \leq 900 \text{ (Cream)} \\ & x \geq 0 \\ & y \geq 0 \end{aligned}$$