

This test is worth 100 points. There are three problems. Problems 1 and 2 are worth 35 points each, and Problem 3 is worth 30 points. You should clearly show all of your work and justify your answers where appropriate.

1. P.J. Edward Furniture Design produces chairs and sofas. The chairs require 20 feet of wood, 1 pound of foam rubber, and 2 square yards of fabric. The sofas require 100 feet of wood, 50 pounds of foam rubber, and 20 square yards of fabric. The company has 1900 feet of wood, 500 pounds of foam rubber, and 240 square yards of fabric. The chairs can be sold for \$80 each and the sofas for \$1200 each.

(a) What are the products? Assign production variables for each product.

(b) What are the resources?

(c) What is the profit function?

(d) What are the constraints (including non-negativity)?

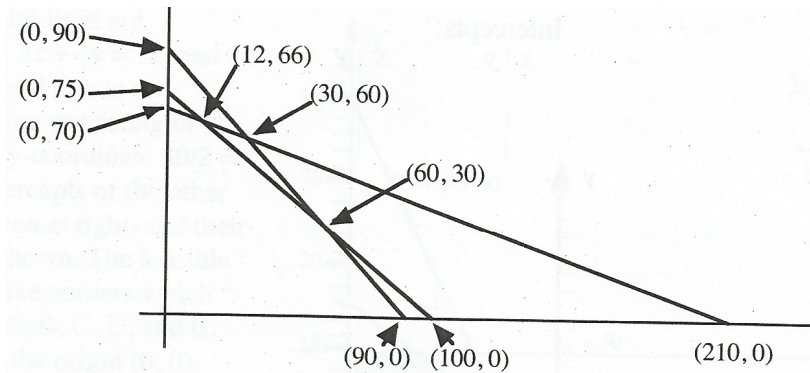
2. Sketched below are the graphs of the constraint lines associated with this system of constraints. The coordinates of the intercepts and intersections of the constraint lines are also given.

$$x + 3y \leq 210$$

$$x + y \leq 90$$

$$3x + 4y \leq 300$$

$$x \geq 0, y \geq 0$$



- (a) Shade the feasible region.
- (b) Is the point $(40, 45)$ feasible? If so, how much slack is in each constraint?
- (c) Is the point $(35, 50)$ feasible? If so, how much slack is in each constraint?
- (d) List the coordinates of all of the corner points.
- (e) Find the maximum value of $P = 60x + 40y$ on this feasible region and give the coordinates of the point(s) at which it is attained.

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3. The Juicy Fruit Company makes three types of fruit mixtures labeled X, Y, and Z, from peaches, pears, and cherries. The company analyst lets x , y , and z be the number of cans of mixtures X, Y, and Z, respectively, that the company should make. She formulates the constraints and profit:

$$3x + 2y \leq 30,000 \text{ pounds of peaches}$$

$$3x + 2y + 3z \leq 33,000 \text{ pounds of pears}$$

$$2y + 3z \leq 27,000 \text{ pounds of cherries}$$

$$x \geq 0, y \geq 0, z \geq 0$$

$$P = 2x + 4y + 3z \text{ dollars}$$

After rewriting the constraints and profit function into an initial matrix, and entering this into the Simplex Method software, she obtains the following result:

x	y	z	s1	s2	s3	P	
1	0	-1	0.33	0	-0.33	0	1000
0	0	3	-1	1	0	0	3000
0	1	1.5	0	0	0.5	0	13500
0	0	1	0.67	0	1.33	1	56000

- (a) What are the basic variables for this matrix? What are the values for each of them?
- (b) What are the nonbasic variables for this matrix? What are the values for each of them?
- (c) How many cans of each kind of fruit mixture should the company make to have the maximum profit?
- (d) What will be the maximum profit?