Name _____ Exam - Chapter 4.6-5.3
Fall '99 Math 166

Show all work

1. Solve the following system of equations using matrix inverse methods. (12 pts)

$$0.05x_1 + 0.65x_2 = 174$$

$$0.40x_1 + 0.20x_2 = 192$$

2. Use matrix inverse methods to solve the following. (14 pts)

Labor and material costs for manufacturing two guitar models are given in the table:

Guitar Model	Labor Cost	Materials Cost
A	\$35	\$12
B	\$50	\$20

If there is a weekly allocation of \$3600 for labor and \$1400 for materials, how many of each guitar model should be produced each week to use exactly the allocation given?

3. Use matrix inverse methods to solve the following. (15 pts)

An economy is based on two industrial sectors, coal and steel. Production of a dollar's worth of coal requires an input of \$0.05 from the coal sector and \$0.65 from the steel sector. Production of a dollar's worth of steel requires an input of \$0.40 from the coal sector and \$0.20 from the steel sector. Find the output for each sector that is needed to satisfy a final demand of \$15 billion for coal and \$50 billion for steel.

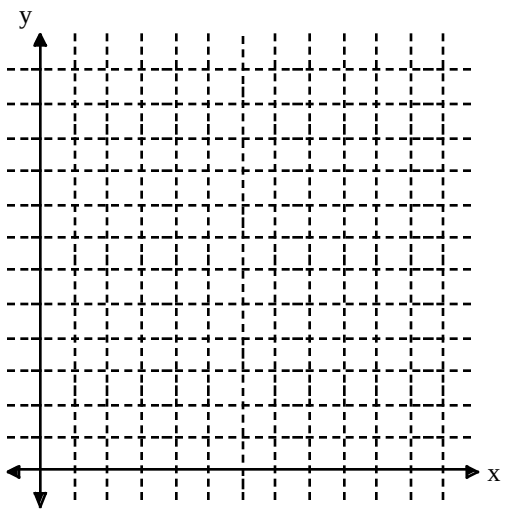
4. Graph the system of inequalities, and identify the corner points. (14 pts)

$$3x + 4y \le 1800$$

$$x + 4y \ge 1000$$

$$x \ge 0$$

$$y \ge 0$$



5. Set up the linear programming problem that would be used to solve this problem (be sure to define your variables). Do NOT solve the problem. (14 pts)

A fruit grower can use two types of fertilizer in his orange grove, Brand A and Brand B. Each bag of Brand A contains 4 lbs of nitrogen, 3 lbs of phosphoric acid, and 1 lb of chlorine. Each bag of Brand B contains 6 lbs of nitrogen, 4 lbs of phosphoric acid, and 2 lbs of chlorine. Tests indicate that the grove needs at least 1200 lbs of phosphoric acid amd at most 500 lbs of chlorine. The grower wants to maximize the amount of nitrogen added to the grove.

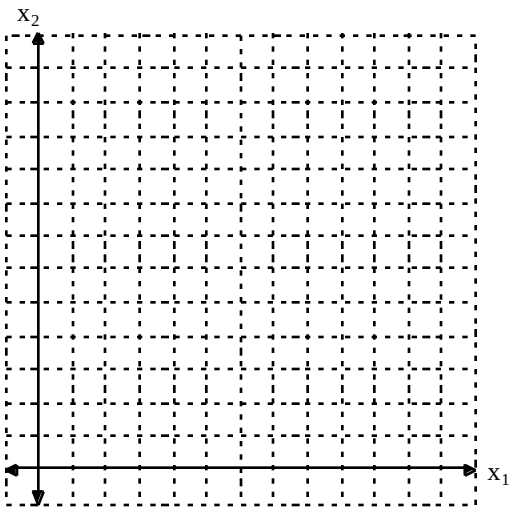
For questions 6 and 7, use the given graph of the feasible region to solve each linear programming problem. (12 pts each)

6. Minimize & maximize $z = 10x_1 + 70x_2$

Subject to $2x_1 + x_2 \geq 80$

$x_1 + 3x_2 \geq 90$

$x_1 , x_2 \geq 0$



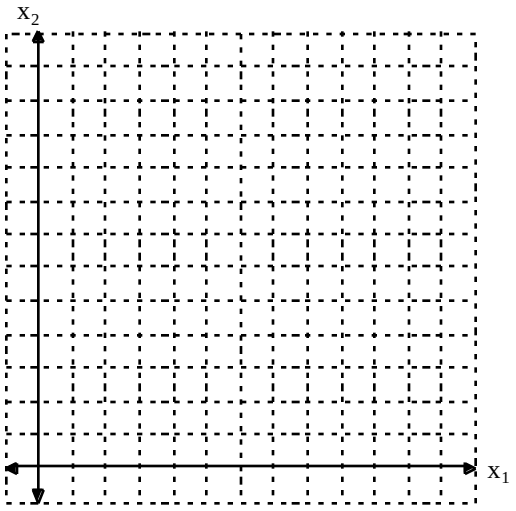
7. Minimize & maximize $z = 15x_1 + 10x_2$

Subject to $2x_1 + x_2 \leq 100$

$x_1 + x_2 \leq 60$

$x_1 + 2x_2 \leq 100$

$x_1 , x_2 \geq 0$



8. $$2x_1 + x_2 \leq 200$$
$$x_1 + x_2 \leq 80$$
$$x_1 , x_2 \geq 0$$

a) Introduce slack variables to convert the above system of inequalities to a system of equations. (6 pts)

b) Find any 4 basic solutions to the system of equations from part (a). (6 pts)

c) Which of the basic solutions in part (b) are feasible? (3 pts)