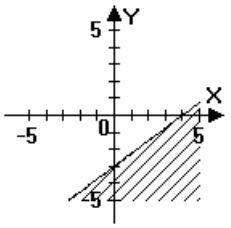
Finite Math
Test two review problems.

1. Solve the following linear programming problem using the graphical method , and find the corners the solution region..
   Maximize $P = 2x + 7y$ subject to
   $$x + y \le 10$$
   $$x + 2y \le 16$$
   $$x \ge 0,\ y \ge 0$$
   Answer: $x = 0, y = 8, P = 56$
2. Solve the following linear programming problem using the graphical method , and find the corners the solution region.
   Minimize $C = 3x + 2y$ subject to
   $$3x + y \ge 12$$
   $$2x + 7y \ge 21$$
   $$x + y \ge 8$$
   $$x \ge 0, y \ge 0$$
   Answer: $x = 2,\ y = 6,\ C = 18$

3. A manufacturer of microwave ovens must ship at least 500 ovens to its two central warehouses. Each warehouse can hold a maximum of 500 ovens. The first warehouse already has 50 ovens on hand, while the second has 40 ovens on hand. It costs \$5 to ship an oven to the first warehouse, while it costs \$6 to ship an oven to the second warehouse. How many ovens should be shipped to each warehouse to minimize the cost?
   Answer: 450 to the first warehouse and 50 to the second

4. Two varieties of animal feed contain essential nutrients *A* and *B*. Feed I contains 2 units of *A* and 3 units of *B* per pound. Feed II contains 2 units of *A* and 5 units of *B* per pound. A farmer needs a feed mix that will give his animals a minimum of 16 units of *A* and 30 units of *B*. If Feed I costs \$3 per pound and Feed II costs \$4 per pound, how much of each should be bought to supply the proper nutrition while minimizing cost?
   Answer: 5 pounds of Feed I, 3 pounds of Feed II

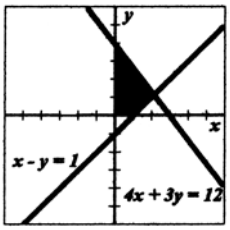
4. Find the graphical solution of the inequality $3x - 4y \ge 12$.
   Answer:



5.
Determine the solution set for the following system of inequalities graphically.

$x - y \le 1,\ \ 4x + 3y \le 12,\ \ x \ge 0,\ \ y \ge 0$

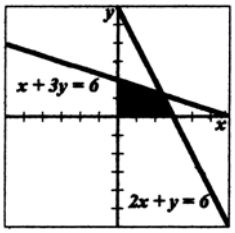
Answer:



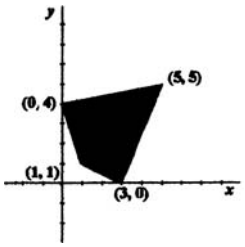
6.
Determine the solution set for the following system of inequalities graphically.

$2x + y \le 6,\ \ x + 3y \le 6,\ \ x \ge 0,\ \ y \ge 0$

Answer:

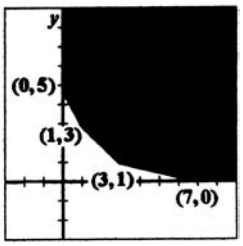


7. Find the maximum and minimum values of $Z = 4x + 3y$ (if they exist) on the feasible set *S*.



Answer: $Z_{\max} = 35,\ \ Z_{\min} = 7$

8. Find the maximum and minimum values of $Z = 3x + y$ (if they exist) on the feasible set *S*.



Answer: $Z_{\max}$: none exists, $Z_{\min} = 5$

9. Determine whether the simplex tableau below is in final form. If so, find the solution to the associated regular linear programming problem. If not, find the pivot element to be used in the next iteration of the simplex method.

x	y	u	v	P	Constant
2	1	–3	0	0	12
1	0	1	1	0	5
2	0	2	0	1	50

Answer: Final form; $x = 0,\ y = 12,\ u = 0,\ v = 5,\ P = 50$

10. Determine whether the simplex tableau below is in final form. If so, find the solution to the associated regular linear programming problem. If not, find the pivot element to be used in the next iteration of the simplex method.

x	y	z	u	v	w	P	Constant
3	2	1	1	0	0	0	40
1	6	4	0	1	0	0	60
5	1	4	0	0	1	0	90
–6	–5	–9	0	0	0	1	0

Answer: Not in final form; pivot element is 4 (row 2, column 3)

11. Set up the initial simplex tableau associated with the following linear programming problem:
A company manufactures three products, *A, B* and *C,* with profits of \$15, \$30. and \$10, respectively. On Machine I, *A* requires 12 minutes, *B* requires 35 minutes, and *C* requires 34 minutes. On Machine II, *A* requires 31 minutes, *B* requires 27 minutes, and *C* requires 40 minutes. In final assembly, *A, B* and *C* require 26 minutes, 28 minutes, and 43 minutes, respectively. During each 16-hour day, the total time available on Machine I is 3 hours, on Machine II, 2 hours, and in final assembly, 7 hours. Let x, y and z represent the respective numbers of units of A, *B* and *C* produced in each 16-hour day. How many units of each product should be produced in order to maximize the company's profit? (Do not solve.)

Answer:

x	y	z	u	v	w	P	Constant
12	35	34	1	0	0	0	180
31	27	40	0	1	0	0	120
26	28	43	0	0	1	0	420
–15	–20	–10	0	0	0	1	0

(Row order and the basic columns, *u, v* and *w* may vary.)

12. Carry out the pivoting process on the following simplex tableau.

x	y	z	u	v	w	P	Constant
2	1	1	1	0	0	0	180
1	3	2	0	1	0	0	300
2	1	2	0	0	1	0	240
–6	–5	–4	0	0	0	1	0

Answer:

x	y	z	u	v	w	P	Constant
1	0	1/5	3/5	–1/5	0	0	48
0	1	3/5	–1/5	2/5	0	0	84
0	0	1	–1	0	1	0	60
0	0	1/5	13/5	4/5	0	1	708

13. Solve the following linear programming problem using the simplex method.
Maximize $P = x + 2y + z$ subject to

$$2x + y + z \le 12$$
$$x + 2y + 3z \le 18$$
$$x + y + 2z \le 24$$
$$x \ge 0, y \ge 0, z \ge 0$$

Answer: Maximum is 18 at (0, 9, 0) or (2, 8, 0)

14. Write the dual problem for the following minimization problem. Do not solve.
Minimize $C = 200x + 105y + 90z$ subject to

$$2x + y - 10z \ge 8$$
$$x + y + 9z \ge 5$$
$$x \ge 0, y \ge 0, z \ge 0$$

Answer: Maximize $P = 8u + 5v$ subject to

$$2u + v \le 200$$
$$u + v \le 105$$
$$-10u + 9v \le 90$$
$$u \ge 0, v \ge 0$$

15. A runner is interested in mixing two cereals to minimize calorie intake while maintaining 120 units of calcium and 20 units of iron in each serving. The first cereal has 6 units of calcium, 1.6 units of iron, and 14 calories in each ounce. The

second cereal has 12 units of calcium, 1.2 units of iron, and 11 calories in each ounce. How much of each cereal should she consume to minimize caloric intake while maintaining the desired amounts of calcium and iron?

Answer: Minimum of 178 calories with 8 ounces of first cereal and 6 ounces of the second

GOOD LUCK