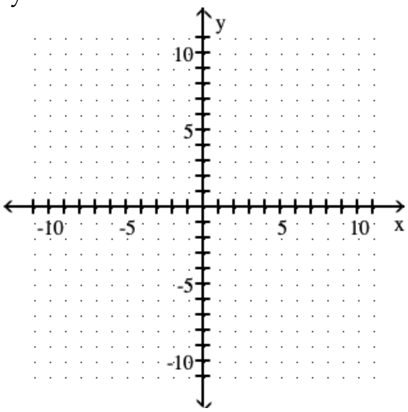
Math 230 **HW 3** Name ________________________

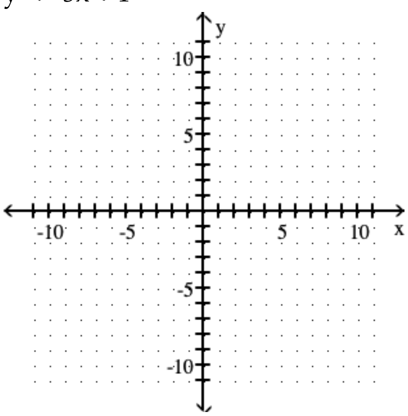
3.1 Linear Inequalities

Graph the linear inequality.

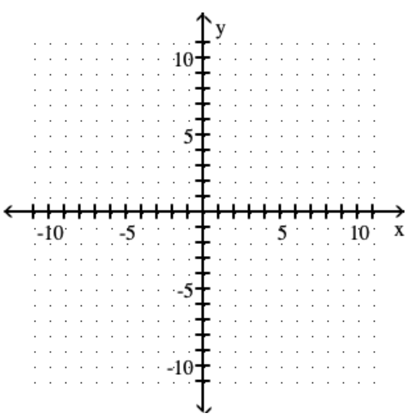
1) $5x + y \le -1$



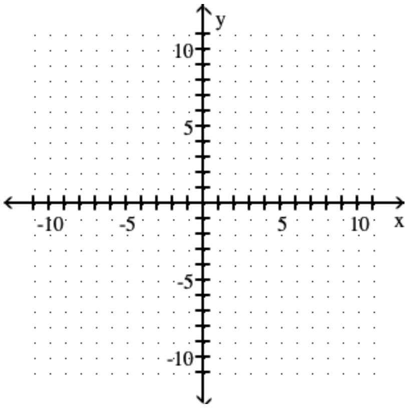
2) $y < -5x + 1$



3) $y \ge -2$

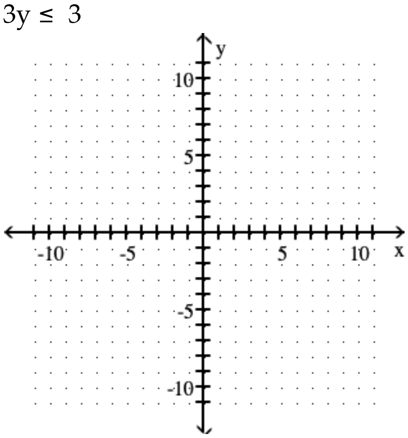


4) $x \geq 3$

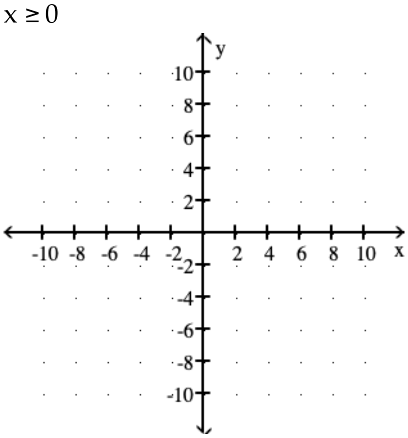


Graph the feasible region for the system of inequalities.

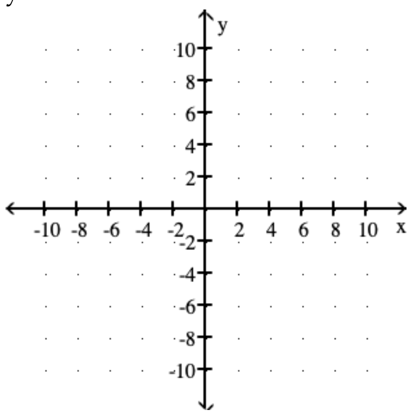
5) $3x + 4y \leq 12$
$x - 3y \leq 3$



6) $2y + x \geq -2$
$y + 3x \leq 9$
$y \leq 0$
$x \geq 0$



7) $4y + x \ge -2$
$y + 2x \le 10$
$4y \le 10x + 40$
$y \ge 0$



Write the system of inequalities that describes the possible solutions to the problem.

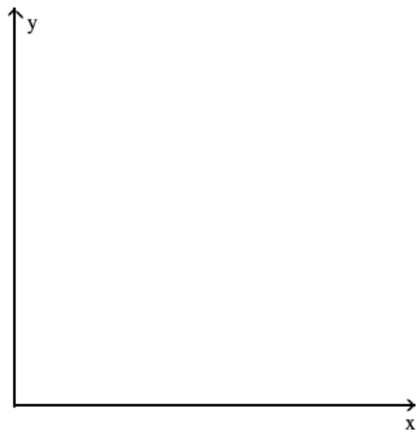
8) A manufacturer of wooden chairs and tables must decide in advance how many of each item will be made in a given week. Use the table to find the system of inequalities that describes the manufacturer's weekly production.

Use x for the number of chairs and y for the number of tables made per week. The number of work–hours available for construction and finishing is fixed.

	Hours per chair	Hours per table	Total hours available
Construction	2	3	36
Finishing	2	2	28

Graph the feasible region of the system.

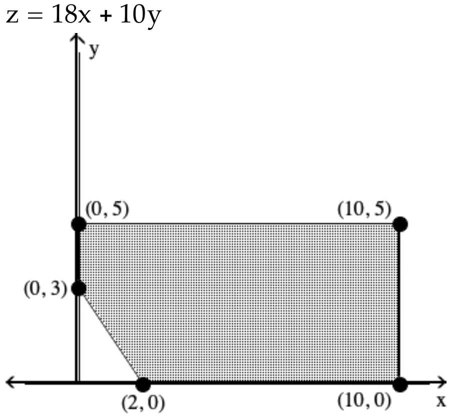
9) An airline with two types of airplanes, P_1 and P_2, has contracted with a tour group to provide transportation for a minimum of 400 first class, 750 tourist class, and 1500 economy class passengers. Airplane P_1 can accommodate 20 first class, 50 tourist class, and 110 economy class passengers. Airplane P_2 can accommodate 18 first class, 30 tourist class, and 44 economy class passengers.
Let x represent the number of planes of type P_1 and y represent the number of planes of type P_2.



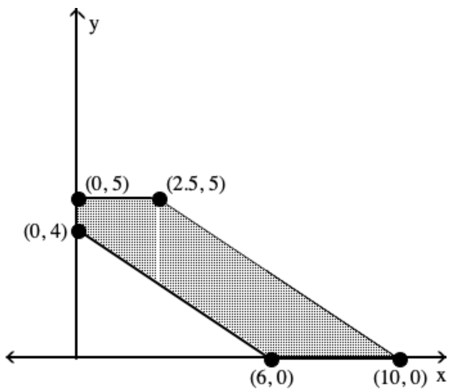
3.2 Objective Functions and Feasibility Regions

Use the indicated region of feasible solutions to find the maximum and minimum values of the given objective function.

10) $z = 18x + 10y$



11) $z = 8x + 8y$.



Use graphical methods to solve the linear programming problem.

12) Maximize $z = 6x + 7y$

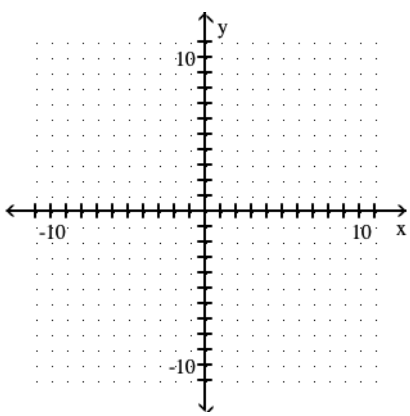
subject to:

$2x + 3y \leq 12$

$2x + y \leq 8$

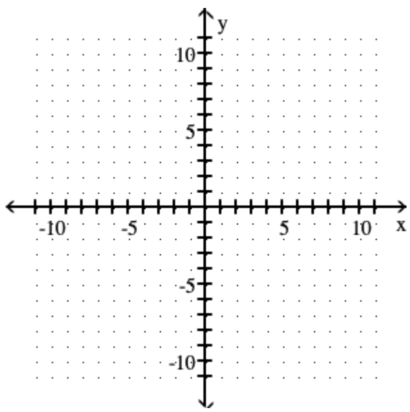
$x \geq 0$

$y \geq 0$



13) Maximize $z = 4x + 5y$

subject to:
$2x - 4y \le 10$
$2x + y \ge 15$
$0 \le x \le 9$
$0 \le y \le 5$



Express the given situation as a linear inequality.

14) Marcie Kohl spends 3 hr building a hutch and 5 hr building a display case. She works no more than 48 hr per week. Let x be the number of hutches built and y be the number of display cases.

3.3 Applications of Linear Programming

Solve.

15) The Acme Class Ring Company designs and sells two types of rings: the VIP and the SST. They can produce up to 24 rings each day using up to 60 total man-hours of labor. It takes 3 man-hours to make one VIP ring and 2 man-hours to make one SST ring. How many of each type of ring should be made daily to maximize the company's profit, if the profit on a VIP ring is \$20 and on an SST ring is \$50?

Solve

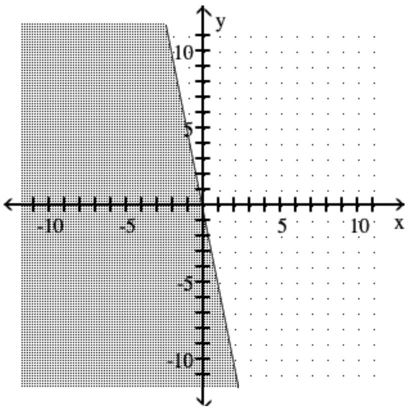
16) A chemical company must use a new process to reduce pollution. The old process emits 6 g of sulphur and 3 g of lead per liter of chemical made. The new process emits 2 g of sulphur and 4 g of lead per liter of chemical made. The company makes a profit of 25¢ per liter under the old process and 16¢ per liter under the new process. No more than 18,000 g of sulphur and no more than 12,000 g of lead can be emitted daily. How many liters of chemicals should be made daily under each process to maximize profits?

Set up the problem but DO NOT SOLVE: state the objective function and the contraint inequalities.,

17) Suppose an animal feed to be mixed from soybean meal and oats must contain at least 100 lb of protein, 20 lb of fat, and 9 lb of mineral ash. Each 100–lb sack of soybean meal costs $20 and contains 50 lb of protein, 10 lb of fat, and 8 lb of mineral ash. Each 100–lb sack of oats costs $10 and contains 20 lb of protein, 5 lb of fat, and 1 lb of mineral ash. How many sacks of each should be used to satisfy the minimum requirements at minimum cost?

Answer Key
Testname: MATH230_LIAL_HW3

1)



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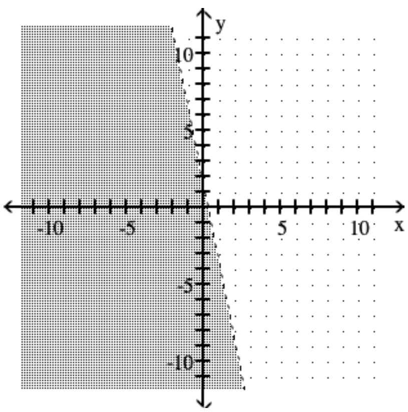
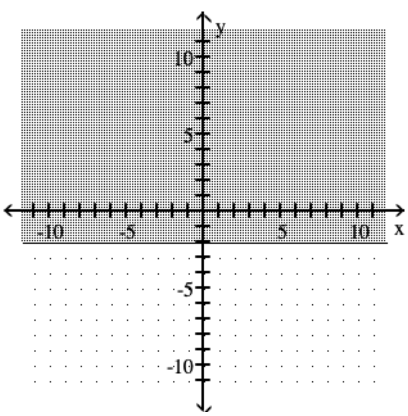


3)



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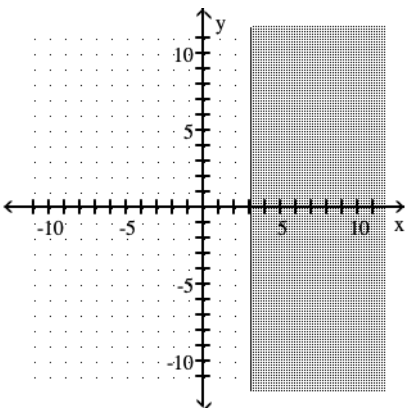
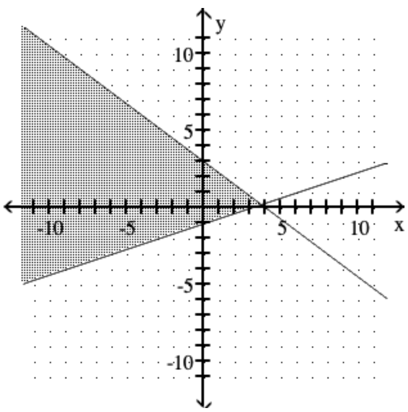

y
10
5
-5
-10
-10
-5
5
10
x

5)


y
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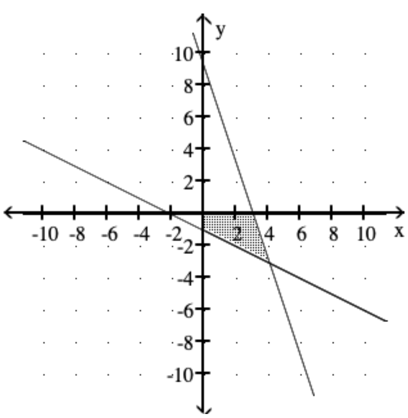
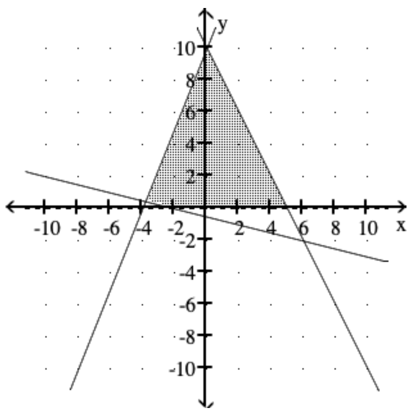
5
-5
-10
-10
-5
5
10
x

6)


y
10
8
6
4
2
-2
-4
-6
-8
-10
-10
-8
-6
-4
-2
2
4
6
8
10
x

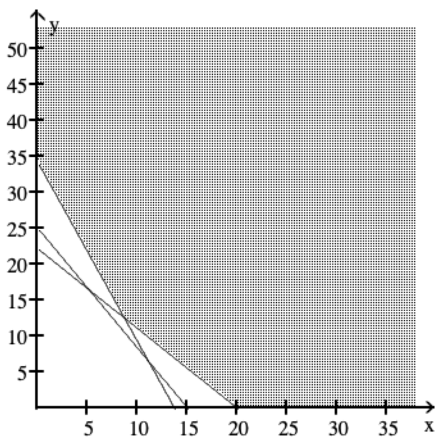
Answer Key
Testname: MATH230_LIAL_HW3

7)



8) $2x + 3y \leq 36$
$2x + 2y \leq 28$
$x \geq 0$
$y \geq 0$

9)



10) Maximum of 230; minimum of 30
11) Maximum of 80; minimum of 32
12) Maximum of 32 when $x = 3$ and $y = 2$
13) Maximum of 61 when $x = 9$ and $y = 5$
14) $3x + 5y \leq 48$
15) 0 VIP and 24 SST
16) 2666 liters under the old process, 1000 liters under the new process
17) 2 sacks of soybeans and 0 sacks of oats