# Math 140: Week-in-Review 4 (3.1-3.3)

1. **Set up the following linear programming problem, but do not solve**

   Nash Furniture Company manufactures tables and chairs. Each table requires 45 feet of wood and 4 labor-hours. Each chair requires 20 feet of wood and 5 labor-hours. The profit from the sale of each table is \$65, and the profit for each chair is \$30. In a certain week, the company has 4300 feet of wood available and 480 labor-hours. How many tables and chairs should Nash Furniture Company manufacture and sell to maximize its profits?

   **Variables**:

   _____:= _____

   _____:= _____

   _____:= _____

   **Objective**: Maximize/Minimize _____

   **Subject to**: _____

   _____

   _____

   _____

   _____

2. **Set up the following linear programming problem, but do not solve**

   A housing contractor wants to develop a 42 acre tract of land. He has three types of houses: a small 3 bedroom, a large 3 bedroom and a 4 bedroom house. The small three bedroom house requires \$70,000 of capital for a profit of \$20,000, the large three bedroom house requires \$84,000 of capital for a profit of \$25,000, and the four bedroom house requires \$100,000 of capital for a profit of \$24,000. The small three bedroom needs 3000 labor hours, the large three bedroom needs 3500 labor hours, and the 4 bedroom house needs 3900 labor hours. There are currently 250,000 labor hours available. If the small three bedroom house is on half an acre, the large 3 bedroom house is on 0.75 acres, the four bedroom house is on 1.5 acres and the contractor has \$6 million in capital, how many of each type should be built to maximize the profit?

   **Variables**:

   _____:= _____

   _____:= _____

   _____:= _____

   _____:= _____

   **Objective**: Maximize/Minimize _____

   **Subject to**: _____

   _____

   _____

   _____

   _____

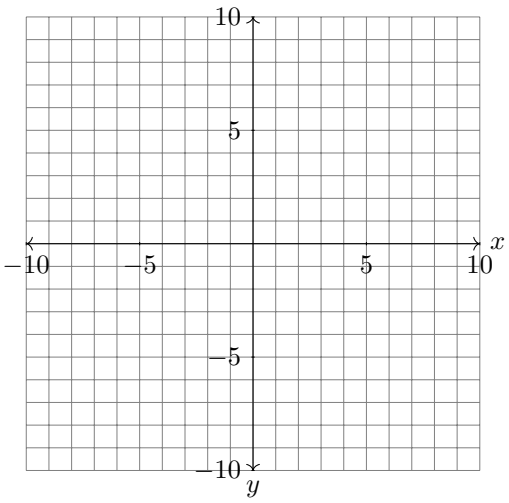
3. **Set up the following linear programming problem, but do not solve**

   Etina Mining Company operates two mines for the purpose of extracting gold and copper. The Lonekop Mine costs $20,000 per day to operate and it yields 1.5kg of gold and 35kg of copper each day. The Mimosa Mine costs $25,000 per day to operate and it yields 2kg of gold and 15kg of copper each day. The company has a target of at least 22kg of gold and 230kg of copper. How many days should each mine be operated so as to meet the target at a minimum cost?

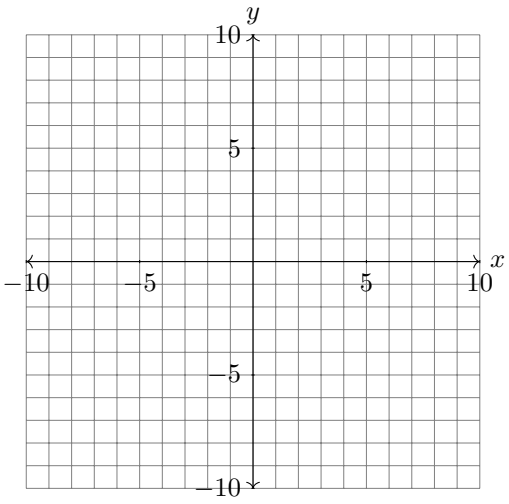
4. **Set up the following linear programming problem, but do not solve**

   You have \$15,000 to invest, some in Stock A and some in Stock B. You have decided that the money invested in Stock A must be at least twice as much as that in Stock B. However, the money invested in Stock A must not be greater than \$12,000. If Stock A earn 4% annual interest, and Stock B earn 5% annual interest, how much money should you invest in each to maximize your annual interest?

5. Graph the inequality $5x - 9y < 21$, labeling the boundary line and the solution set with **S**.




6. Graph the inequality $-4x + 7y \geq 0$, labeling the boundary line and the solution set with **S**.



7. Graph the system of linear inequalities below, and then label the solution set with **S**. Then state whether the solution set is bounded or unbounded and the exact corner point(s) of the solution set.

$$\begin{aligned} 3x + y &\leq 12 \\ 6x + 5y &\geq 30 \\ x + 2y &\leq 14 \\ x \geq 0, \;\; y &\geq 0 \end{aligned}$$

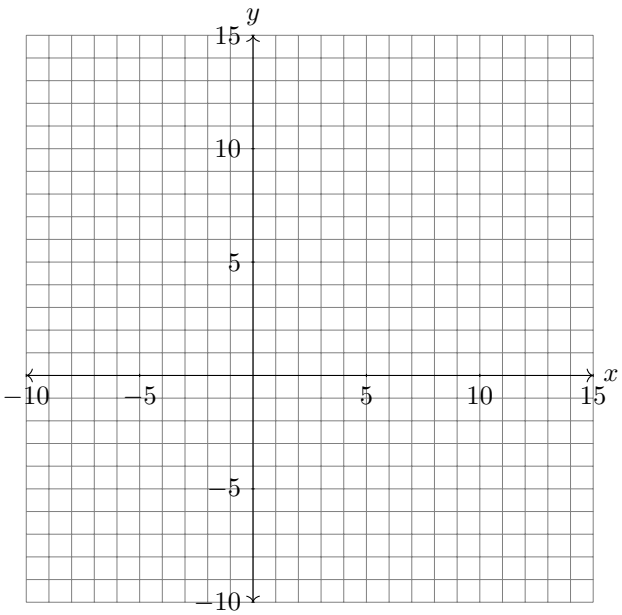
$3x + y \leq 12$ $\quad$ $6x + 5y \geq 30$ $\quad$ $x + 2y \leq 14$ $\quad$ $x \geq 0$ $\quad$ $y \geq 0$

**Boundary Line**:

***x*-intercept**:

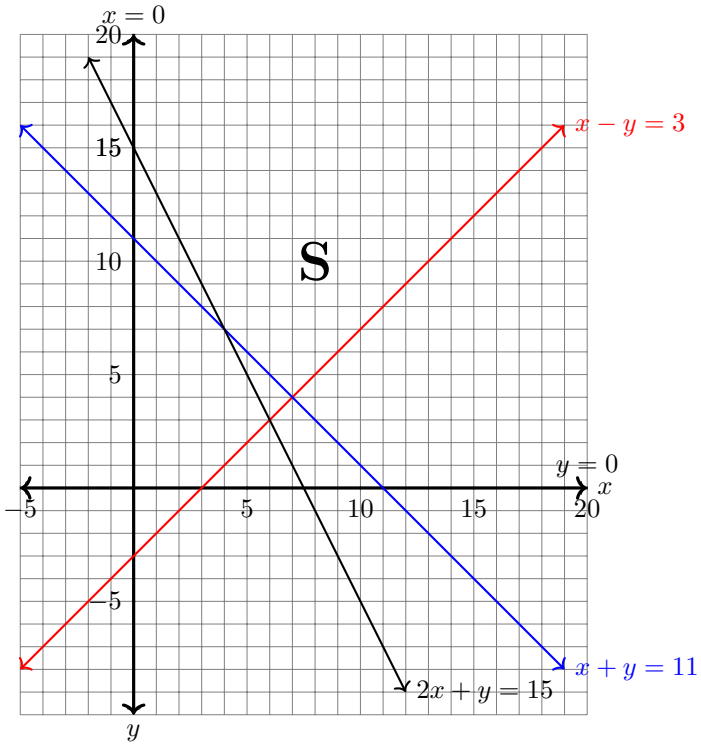
***y*-intercept**:

**Test Point**:

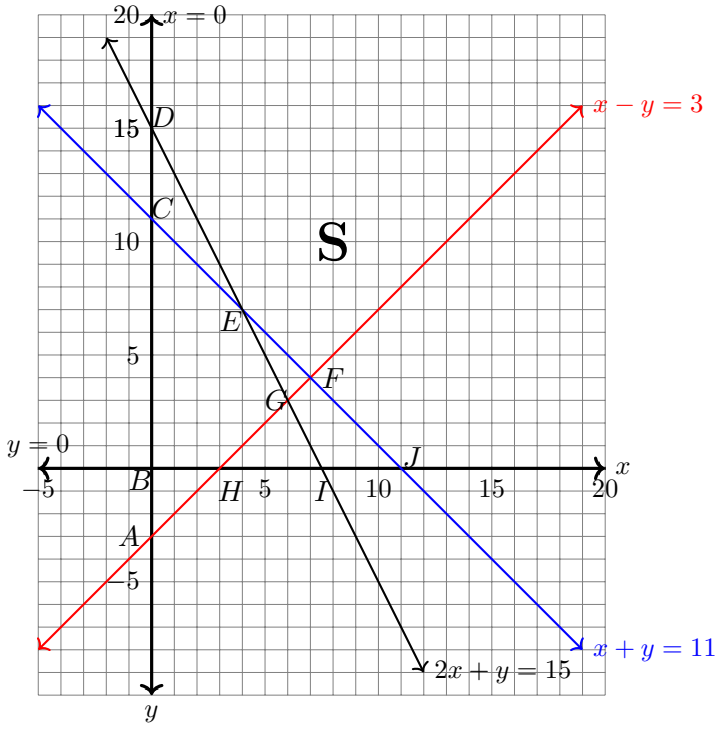



**Corner Points:**

8. Use the graph below to write the corresponding system of linear inequalities.



9. Use the feasible region to determine the maximum and minimum values of the objective function $z = 2x + y$ over the region, if they exist and where they occur.




| $(x, y)$ | | |
|---|---|---|
| $A$: $(0, -3)$ | | |
| $B$: $(0, 0)$ | | |
| $C$: $(0, 11)$ | | |
| $D$: $(0, 15)$ | | |
| $E$: $(4, 7)$ | | |
| $F$: $(7, 4)$ | | |
| $G$: $(6, 3)$ | | |
| $H$: $(3, 0)$ | | |
| $I$: $(7.5, 0)$ | | |
| J: $(11, 0)$ | | |

10. Use the Method of Corners to solve the following linear programming problem.

Objective: Maximize $P = 12x + 8y$

Subject to: $3x + y \leq 15$

$6x + 5y \geq 33$

$x + 2y \leq 15$

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

11. **Solve using the Method of Corners**

You have \$15,000 to invest, some in Stock A and some in Stock B. You have decided that the money invested in Stock A must be at least twice as much as that in Stock B. However, the money invested in Stock A must not be greater than \$12,000. If Stock A earn 4% annual interest, and Stock B earn 5% annual interest, how much money should you invest in each to maximize your annual interest?

12. A company manufactures two types of furniture: chairs and rockers. Each chair requires 1 box of screws, 2 units of plastic, and 4 units of wood. Each rocker takes 2 boxes of screws, 3 units of plastic, and 2 units of wood. The company has 65 boxes of screws, 110 units of plastic, and 105 units of wood on hand.

    In order to maximize their profit using these materials on hand, the company has determined that they must make 13 chairs and 22 rockers. How many of each of the materials (boxes of screws, units of plastic, and units of wood) are left over when the company makes 13 chairs and 22 rockers?