SECTION 3.1: SETTING LINEAR PROGRAMMING PROBLEMS

- Always Define Your Variables
- Objective Function
- Constraints

Pr 1. Set up, but do not solve.

A housing contractor wants to develop a 60 acre tract of land. He has three types of houses: a two-bedroom, a three-bedroom and a four-bedroom house. The two-bedroom house requires $70,000 of capital for a profit of $20,000, the 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 two-bedroom needs 3000 labor hours, the three-bedroom needs 3500 labor hours, and the four-bedroom house needs 3900 labor hours. There are currently 250,000 labor hours available. If the two-bedroom house is on half an acre, the large four-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 of house should be built to maximize the profit?

Variables:

_______:= ____

_______:= ____

_______:= ____

_______:= ____

⋮

Objective: Maximize/ Minimize ____

Subject to: ____

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Pr 2. Set up, but do not solve.

Your burger company sells three different types of patty melts - the Big cheesy, the double decker, and the classic. These patty melts all use different amounts of cheese (slices), bread (slices), and patties, as given in the table.

	Cheese	Bread	Patties
Big Cheesy	3	2	2
Double Decker	2	3	2
Classic	1	2	1

The profit for the Big Cheesy is \$1, for the Double Decker is \$2 and for the Classic is \$1. Due to certain agreements, the company can make at most 250 Double Deckers. If the company has 300 slices of cheese, 600 slices of bread, and 800 beef patties, how many of each type of patty melt should be produced in order to maximize the profit?

Pr 3. Set up, but do not solve.

You have \$16,000 to invest, some in Stock A, some in Stock B, and some in Stock C. You have decided that the money invested in Stock A must be at least twice as much as that in Stock C. However, the money invested in Stock A must not be greater than \$9,000. If Stock A earns 3% annual interest, Stock B earns 6% annual interest, and Stock C earns 4 % annual interest, how much money should you invest in each to maximize your annual interest?

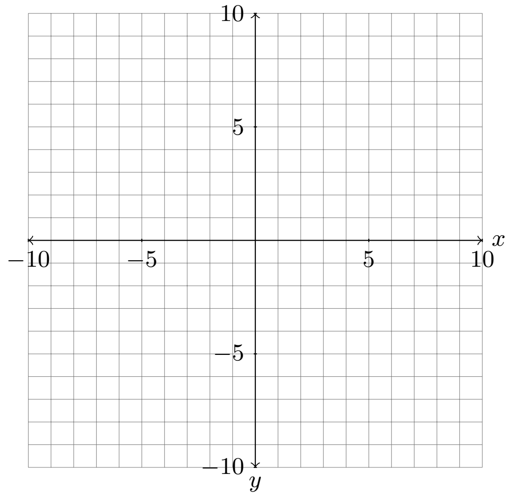
Pr 4. Set up, but do not solve.

An independent soda company makes two soda flavors: big maroon and Gig'em Ginger. Each can of soda requires 2 cups of carbonated water. The Big Maroon uses three tablespoons of sugar, while Gig'em Ginger uses one tablespoon of sugar. Due to limitations on flavor packets, they can only produce 70 cans of Big Maroon. Suppose that they have 240 cups of carbonated water, and 160 tablespoons of sugar. If they sell each can of Big Maroon for \$1, and each can of Gig'em Ginger for \$0.40, how much of each type of soda should they make in order to maximize profit? Will they have any leftovers?

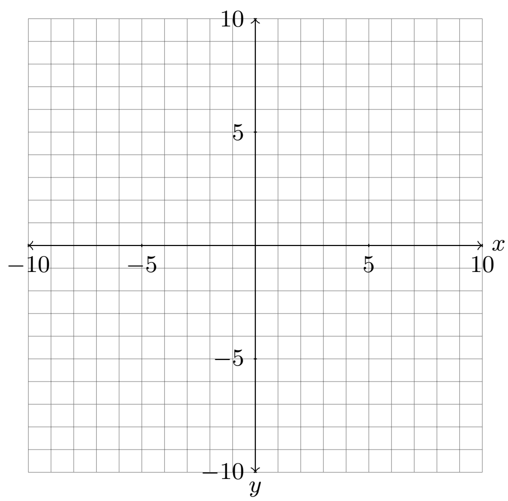
Section 3.2: Graphing Systems of Linear Inequalities in Two Variables

- Solution set to a linear inequality is half of the coordinate plane, while the solution set to a system of linear inequalities is the region of points that satisfy **all** of the linear inequalities in the system.
- Boundary Line - the corresponding linear equation for a a linear inequality
- True Shading vs. Reverse Shading
- Unbounded vs. Bounded solution sets
- Corner Points

Pr 1. Graph the inequality $4x - 9y < 24$, labeling the boundary line and the solution set with **S**.



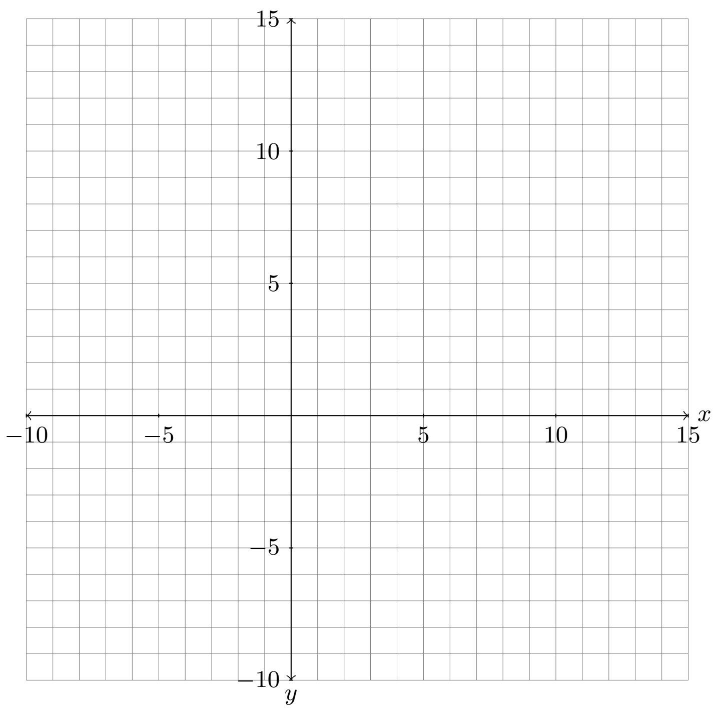
Pr 2. Graph the inequality $-4x + 7y \geq 0$, labeling the boundary line and the solution set with **S**.



Pr 3. Graph the system of linear inequalities, 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.

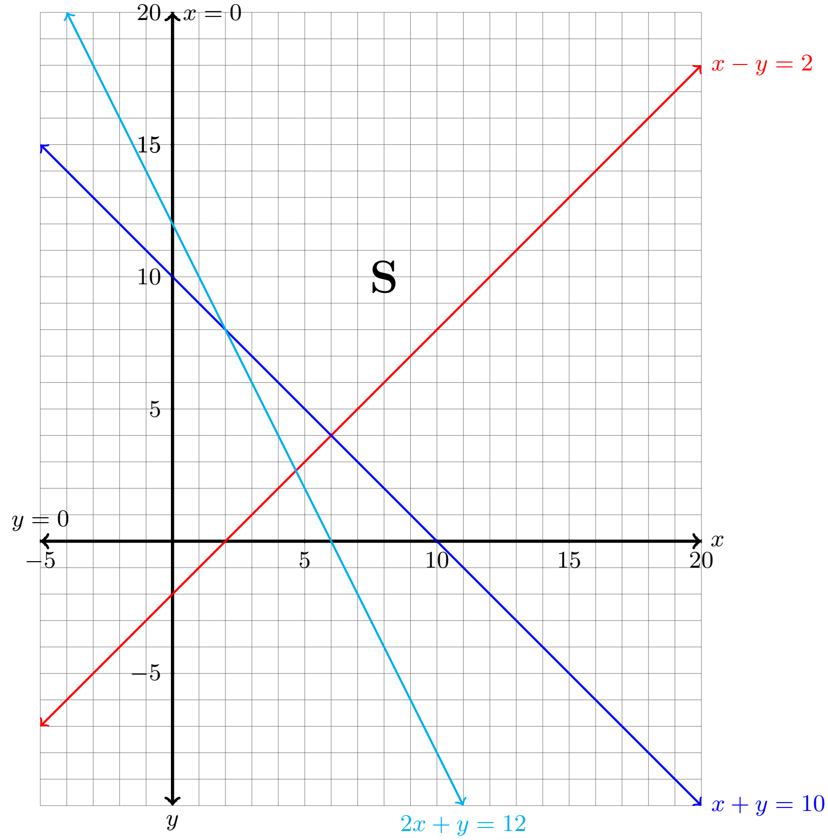
$$3x + y \leq 12$$
$$6x + 5y \geq 24$$
$$x + 2y \leq 16$$
$$x \geq 0, y \geq 0$$

	$3x + y \leq 12$	$6x + 5y \geq 24$	$x + 2y \leq 15$	$x \geq 0$	$y \geq 0$
Boundary Line:					
***x*-intercept**:					
***y*-intercept**:					
Test Point:					



Corner Points:

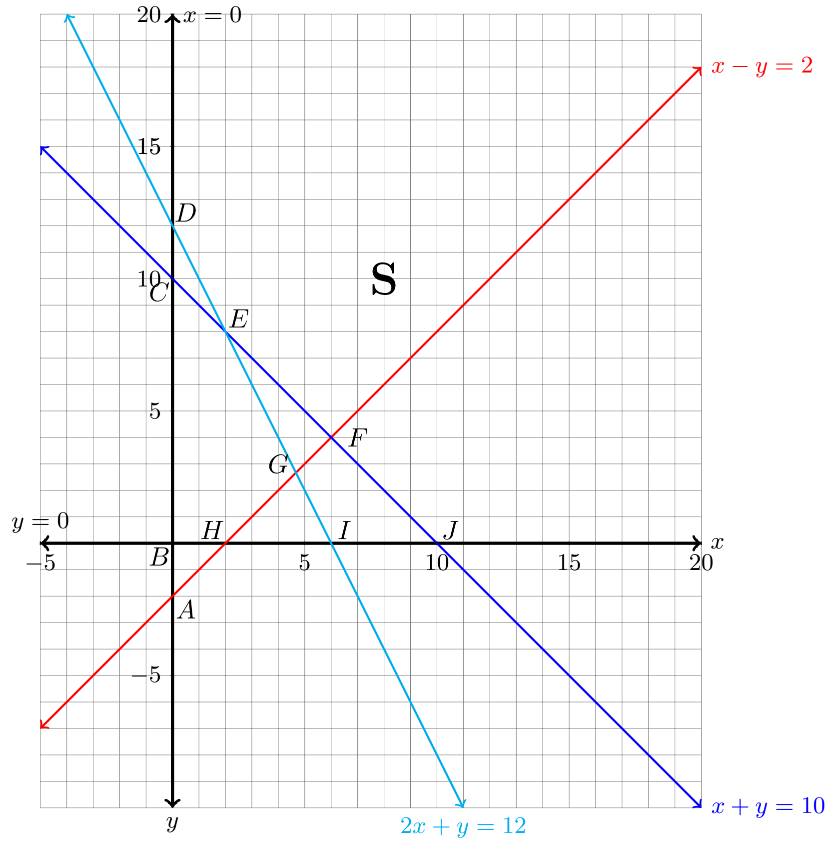
Pr 4. Use the graph below to write the corresponding system of linear inequalities.



Section 3.3: Graphical Solution of Linear Programming Problems

- Feasible Region
- Know the parts of the Fundamental Theorem of Linear Programming
- Method of Corners
  - Set up a linear programming problem algebraically.
  - Graph the constraints and determine the feasible region.
  - Identify the exact coordinates of all corner points of the feasible region.
  - Determine whether or not the linear programming problem will have a solution.
  - If a solution will exist, evaluate the objective function at each corner point and determine the optimal point.
- Leftovers

Pr 1. 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: $(0, -2)$		
B: $(0, 0)$		
C: $(0, 10)$		
D: $(0, 12)$		
E: $(2, 8)$		
F: $(6, 4)$		
G: $(\frac{14}{3}, \frac{8}{3})$		
H: $(2, 0)$		
I: $(6, 0)$		
J: $(10, 0)$		

Pr 2. Use the Method of Corners to solve the following linear programming problem.

Objective: Maximize $P = 12x + 4y$

Subject to: $3x + y \leq 12$

$6x + 5y \geq 24$

$x + 2y \leq 16$

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

Pr 3. An independent soda company makes two soda flavors: big maroon and Gig'em Ginger. Each can of soda requires 2 cups of carbonated water. The Big Maroon uses three tablespoons of sugar, while Gig'em Ginger uses one tablespoon of sugar. Due to limitations on flavor packets, they can only produce 70 cans of Big Maroon. Suppose that they have 240 cups of carbonated water, and 160 tablespoons of sugar. If they sell each can of Big Maroon for \$1, and each can of Gig'em Ginger for \$0.40, how much of each type of soda should they make in order to maximize profit? Will they have any leftovers?