Solving Systems of Equations by Graphing
§3.1

Systems of Equations – a set of equations with the same variables.

Consistent System – a system that has ***at least one*** solution.

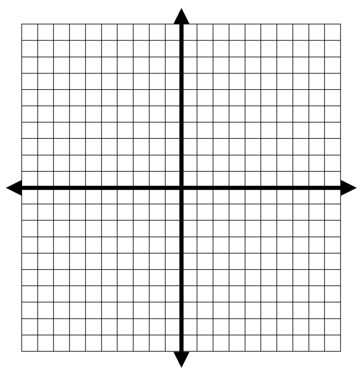
Inconsistent System – a system that ***does not have*** a solution.

Independent System – a system that has ***exactly one*** solution.

Dependent System – a system that has ***infinite amount*** of solutions.

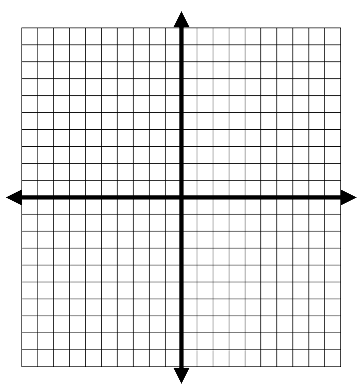
Example 1
Graph each system of equations and state its solution. Also, state whether the system is consistent or inconsistent and dependent or independent.

$x + y = 5$
$3x – 2y = 20$



Example 2
Graph each system of equations and state its solution. Also, state whether the system is consistent or inconsistent and dependent or independent.

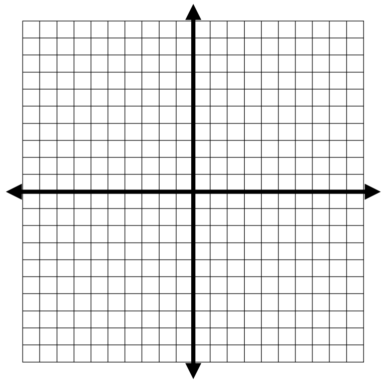
$y = -3x + 5$
$9x + 3y = 15$



Example 3

Graph each system of equations and state its solution. Also, state whether the system is consistent or inconsistent and dependent or independent.

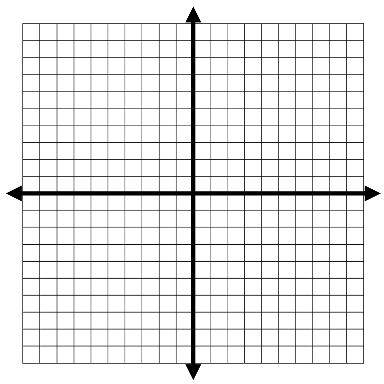
$8x - 4y = 12$
$12x – 6y = 12$

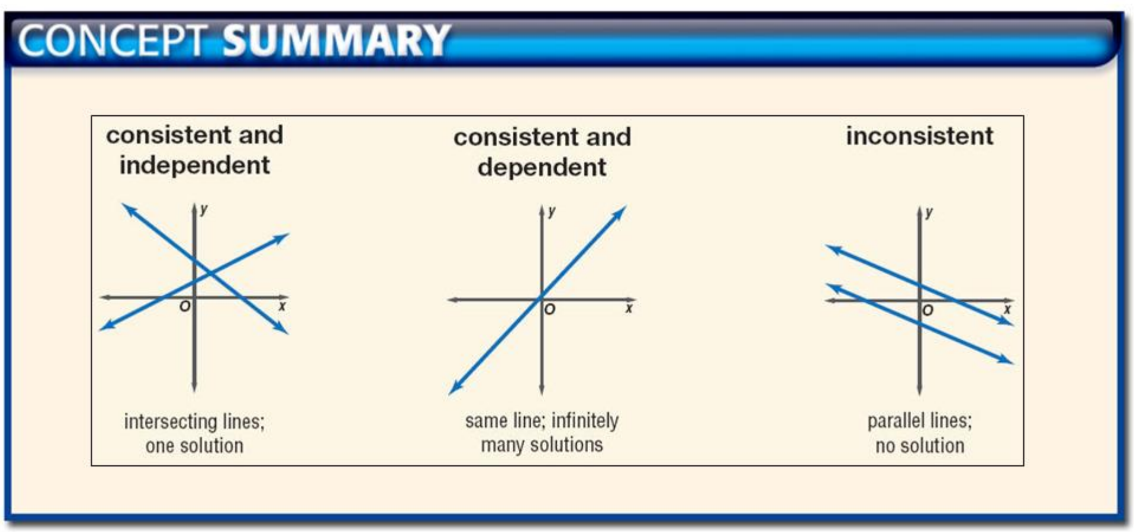


Example 4

Graph each system of equations and state its solution. Also, state whether the system is consistent or inconsistent and dependent or independent.

$y = 4$
$3x = -21$





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Solving Systems of Equations Algebraically
§3.2

<u>2 Ways to Solve Algebraically</u>
1. Substitution
2. Elimination

<u>Example 1</u>
Solve each system of equations by using substitution.

$x + y = 5$
$3x – 2y = 20$

<u>Example 2</u>
Solve each system of equations by using substitution.

$x - 2y = 1$
$3x + 2y = 19$

<u>Example 3</u>
Solve each system of equations by using Elimination.

$x + y = 5$
$3x – 2y = 20$

<u>Example 4</u>

Solve each system of equations by using Elimination.

$7x - 4y = 17$
$3x + 5y = 14$

<u>Example 5</u>
Solve each system of equations by using Elimination.

$2x - 7y = 13$
$-4x + 14y = 6$

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Cramer's Rule
§3.3

Solving Systems of Equations
1. Graphing
2. Substitution
3. Elimination
4. **Cramer's Rule**

Determinant – an array of coefficients in rows and columns when the equations are written in standard form.

$$\begin{aligned} a\boldsymbol{x} + b\boldsymbol{y} &= e \\ c\boldsymbol{x} + d\boldsymbol{y} &= f \end{aligned} \quad = \text{ det A} = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$$

Value of 2^{nd} order determinant.

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

Example 1
Find the value of each determinant.

$$\begin{vmatrix} 3 & 4 \\ 2 & 5 \end{vmatrix}$$

Example 2
Find the value of each determinant.

$$\begin{vmatrix} 3 & -4 \\ -1 & -7 \end{vmatrix}$$

<u>To find x</u>, divide A_x, the determinant with the x column replaced with the constant column, by det A.

$$\begin{aligned} ax + by &= e \\ cx + dy &= f \end{aligned}$$

<u>To find y</u>, divide A_y,the determinant with the y column replaced with the constant column, by det A.

$$\begin{aligned} ax + by &= e \\ cx + dy &= f \end{aligned}$$

<u>Example 3</u>
Use Cramer's Rule to solve each system of equations.

$$\begin{aligned} -3x + 5y &= -1 \\ 2x - 3y &= 1 \end{aligned}$$

<u>Example 4</u>
Use Cramer's Rule to solve each system of equations.

$$\begin{aligned} 2x + 3y &= -11 \\ -3x + 4y &= -26 \end{aligned}$$

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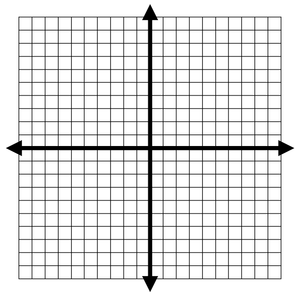
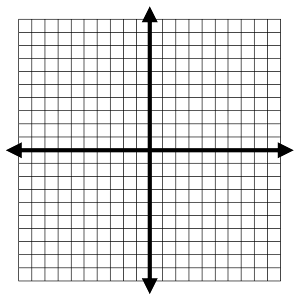
Graphing Systems of Inequalities
§3.4

System of Inequalities must be done by graphing

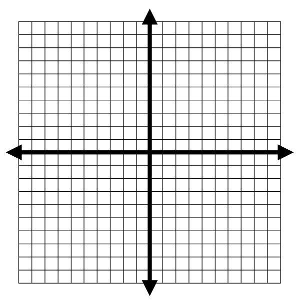
<u>Example 1</u>
$x \geq 5$
$x + y \leq 3$



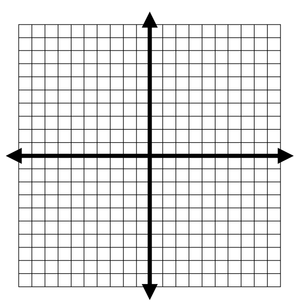
<u>Example 2</u>
$5y > -4x - 4$
$4x + 5y > 10$



<u>Example 3</u>
$y \leq 2x - 3$
$x + 2y \leq 4$



<u>Example 4</u>
$3x - 2y \leq 8$
$-2x - 2y \leq -6$



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Linear Programming
§3.5

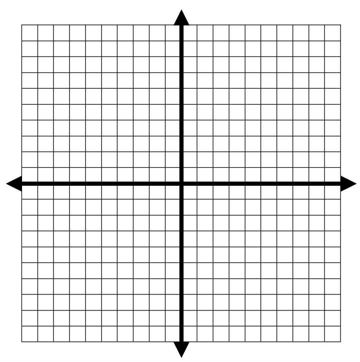
Linear Programming – a method for finding the maximum or minimum value of a function in two variables subject to given constraints on the variables.

Constraints – the inequalities in a system of inequalities whose graphs form the boundaries of the graph of the systems solution.

Feasible Region – the area of intersection of the graphs of inequalities in which every constraint is met.

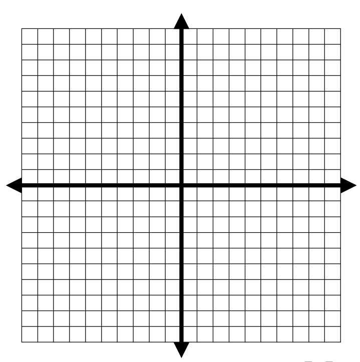
Example 1
Find the maximum and minimum values of f(x, y) = $2x - 3y$ for the polygonal region determined by the system of inequalities.

$x \geq 1$
$y \geq 2$
$x + 2y \leq 9$



Example 2
Find the maximum and minimum values of f(x, y) = $5x + 2y$ for the polygonal region determined by the system of inequalities.

$x - 3y \leq 0$
$x - 3y \geq -15$
$4x + 3y \geq 15$



Pg 157, 7-23 odd

Solving Systems of Equations in Three Variables
§3.7

<u>Example 1</u>
$x + 2y - 3z = 50$
$2x + y + 2z = 3$
$2x - 5y + 4z = -79$

<u>Example 2</u>
$3x - 6y + 3z = 33$
$2x - 4y + 2z = 22$
$4x + 2y - z = -6$

<u>Example 3</u>
$x + 2y + z = 9$
$3y - z = -1$
$3z = 12$

<u>Example 4</u>
$2a - 3b = 13$
$3b + c = -3$
$4a - c = 2$

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