1) \( f(x) = \begin{cases} 
1, & x < -2 \\
5, & x \geq -2
\end{cases} \)

\[ f(x) = 1 \quad f(x) = 5 \]
2) \( f(x) = \begin{cases} 
1, & x < -4 \\
-6, & -4 \leq x < 3 \\
4, & x \geq 3 
\end{cases} \)

\( f(x) = 1 \)  
\( f(x) = -6 \)  
\( f(x) = 4 \)  
\( f(x) = 4 \)
$f(x) = \begin{cases} 
    x + 6, & x < -3 \\
    -2, & x \geq -3 
\end{cases}$

$\begin{align*}
    f(x) &= x + 6 \\
    f(x) &= -2
\end{align*}$
4) \[ f(x) = \begin{cases} 
-5, & x < -4 \\
x + 8, & -4 \leq x \leq 5 \\
3, & x > 5 
\end{cases} \]
1) \[ f(x) = \begin{cases} 
2, & x < -1 \\
-5, & x \geq -1 
\end{cases} \]

2) \[ f(x) = \begin{cases} 
3, & x < -3 \\
-5, & -3 \leq x < 2 \\
7, & x \geq 2 
\end{cases} \]

3) \[ f(x) = \begin{cases} 
-2, & x < -2 \\
x - 6, & x \geq -2 
\end{cases} \]

4) \[ f(x) = \begin{cases} 
-4, & x < -3 \\
x + 2, & -3 \leq x < 4 \\
8, & x \geq 4 
\end{cases} \]
Practice - Piecewise Functions - Solutions

Day 1 - Piecewise Page 6
Worksheet – Piecewise functions
Mr. Chvatal

Please graph the following piecewise functions.

1. \[
f(x) = \begin{cases} 
  2x + 6 & \text{if } -5 < x < -3 \\
  \frac{2}{3}x - 1 & \text{if } -3 \leq x < 3 \\
  x - 5 & \text{if } x \geq 3 
\end{cases}
\]

2. \[
f(x) = \begin{cases} 
  \frac{1}{2}x + 5 & \text{if } x \leq -2 \\
  -\frac{2}{3}x - 2 & \text{if } -2 < x < 0 \\
  4x - 4 & \text{if } x \geq 0 
\end{cases}
\]
3. \[ f(x) = \begin{cases} 
 x^2 - 2x + 1 & \text{if } -1 \leq x < 2 \\
 \frac{1}{2}x + 1 & \text{if } x \geq 2 
\end{cases} \]

4. Please model a piecewise function from the graph below.

\[ f(x) = \begin{cases} 
 -\frac{3}{2}x - \frac{5}{2} & x < -1 \\
 2x - 2 & -1 \leq x \leq 2 \\
 -x + 5 & x > 2 
\end{cases} \]

\[ y = -\frac{3}{2}(x+1) - 1 \]
\[ y = -\frac{3}{2}x - \frac{3}{2} - 1 \]
\[ y = -\frac{3}{2}x - \frac{5}{2} \]
Group Graded Assignment

2. Write a piecewise definition in the form \( y = \) for the graph shown at the right. (Indicated points have integer coordinates.)

\[
\begin{align*}
\text{Answer}
\end{align*}
\]

3. Given:

\[
y = \begin{cases} 
2, & -4 \leq x < -1 \\
-2, & -1 \leq x \leq 4
\end{cases}
\]

\[f(x) = \begin{cases} 
x + 1, & -4 \leq x \leq 1 \\
-x, & 1 < x \leq 3
\end{cases}\]

a. Graph the function.

b. State the domain (the x-values used).

\[
\begin{align*}
\text{Answer}
\end{align*}
\]
4. Dylan rides his motorcycle from his home to his friend's home 125 miles away. The graph at the right shows his journey.
   a) Write a story that will represent his trip.
   b) State the fastest average speed he maintained for at least one hour.

5. It takes Ariel 60 minutes to reach the hiking team's campsite, following a trail depicted in the graph at the right.
   a) Write a story that will describe this hiking journey.
   b) What is the change in the elevation between Ariel's starting point and the campsite?
Notes - Systems of Equations - Graphing

1) \( y = 8x + 4 \)  
   \( y = x - 3 \)

\((-1, -1)\)
Notes - Systems of Equations - Graphing

2) \[ y = -x + 2 \]
\[ y = -5x - 2 \]

\((-1, 3)\)
5) \[ \begin{align*}
x + y &= -4 \\
2x - y &= -2
\end{align*} \]

\[ \begin{align*}
y &= -x - 4 \\
y &= 2x + 2
\end{align*} \]

\[ \begin{align*}
2x - y &= -2 \\
-2x - y &= -2
\end{align*} \]

\[ y = 2x + 2 \]

\((-2, -2)\)
6) \[ \begin{align*}
6x + 3y &= -12 \\
x - 3y &= 6
\end{align*} \]

Solving the system of equations:

\[ \begin{align*}
\frac{6x}{3} &= -x - 4 \\
\frac{6y}{3} &= 2x + 6
\end{align*} \]

Graphing the lines:

\[ y = -\frac{1}{3}x - 4 \]

\[ y = \frac{1}{3}x - 2 \]
3-1 Study Guide and Intervention

Solving Systems of Equations by Graphing

Graph Systems of Equations  A system of equations is a set of two or more equations containing the same variables. You can solve a system of linear equations by graphing the equations on the same coordinate plane. If the lines intersect, the solution is that intersection point.

Example  Solve the system of equations by graphing.

\[ x - 2y = 4 \]
\[ x + y = -2 \]

Write each equation in slope-intercept form.
\[ x - 2y = 4 \quad \rightarrow \quad y = \frac{x}{2} - 2 \]
\[ x + y = -2 \quad \rightarrow \quad y = -x - 2 \]

The graphs appear to intersect at (0, -2).

CHECK  Substitute the coordinates into each equation.
\[ x - 2y = 4 \quad \Rightarrow \quad x + y = -2 \]
\[ 0 - 2(-2) \quad \Rightarrow \quad 0 + (-2) \]
\[ 4 = 4 \checkmark \quad -2 = -2 \checkmark \]

The solution of the system is (0, -2).

Exercises  Solve each system of equations by graphing.

1. \[ y = \frac{-x}{3} + 1 \]
2. \[ y = 2x - 2 \]
3. \[ y = \frac{-x}{2} + 3 \]

\[ y = \frac{x}{2} - 4 \]
\[ y = -x + 4 \]
\[ y = \frac{x}{4} \]

4. \[ 3x - y = 0 \]
5. \[ 2x + \frac{y}{3} = -7 \]
6. \[ \frac{x}{2} - y = 2 \]

\[ x - y = -2 \]
\[ \frac{x}{2} + y = 1 \]
\[ 2x - y = -1 \]
Solve each system by graphing.

1) \( y = -x - 3 \)
   \( y = -7x + 3 \)

2) \( y = -\frac{3}{2}x - 4 \)
   \( y = x + 1 \)

3) \( y = \frac{1}{2}x + 1 \)
   \( y = 3x - 4 \)

4) \( y = -x - 3 \)
   \( y = 5x + 3 \)
Solve each system by substitution. Check your solution in the calculator.

7) \[ y = -3x + 2 \]
\[ -x - 3y = -14 \]

\[ \begin{align*}
-x - 3(-3x + 2) &= -14 \\
-x + 9x - 6 &= -14 \\
8x &= -8 \\
x &= -1
\end{align*} \]

\[ y = -3(-1) + 2 \]
\[ y = 3 + 2 \]
\[ y = 5 \]

\((-1, 5)\)
Solve each system by substitution. Check your solution in the calculator.

8) \(-4x + 2y = -4\)
\[y = 7x - 2\]

\[-4x + 2(7x-2) = -4\]
\[-4x + 14x - 4 = -4\]
\[10x = 0\]
\[x = 0\]

\[y = 7(0) - 2\]
\[y = -2\]

\(x = 0, y = -2\)

\((0, -2)\)
IP - Substitution

Solve each system by substitution.

1) \( y = 3x + 17 \)
   \( y = 4x + 21 \)

2) \( y = -5x - 10 \)
   \( \frac{5x}{5} = \frac{-5x-10}{5} \)
   \( 10x = -10 \)
   \( x = -1 \)
   \( y = -5(-1) + 5 \)

3) \( y = 2x + 4 \)
   \( -7x + 3y = 18 \)

4) \( -2x - 4y = -20 \)
   \( y = x + 4 \)

Solve each system by graphing.

5) \( y = -3 \)
   \( y = 2x + 1 \)

6) \( y = -\frac{1}{2}x + 2 \)
   \( y = x - 1 \)
Answers to SOE - Substitution and Graphing IP

1) (-4, 5)  
2) (-1, -5)  
3) (-6, -8)  
4) (6, 2)  
5) (-2, -3)  
6) (2, 1)
3) \( y = 2x + 4 \)
\[-7x + 3y = 18\]

\[-7x + 3(2x + 4) = 18\]
\[-7x + 6x + 12 = 18\]
\[-x = 6\]
\[x = -6\]

\[y = 2(-6) + 4\]
\[y = -12 + 4\]
\[y = -8\]
Algebra I
Break Even Analysis for Small Business

1) Jesse wants to start a business making and selling skateboards. She will charge $75 for each one. Her cost will be $30 per skateboard for materials. She must pay $500 per month rent (which includes utilities) so that she has a place to make and sell the skateboards.

   a) Write a rule for her revenue (money coming in).

   a) ________________________________

   b) Write a rule for her cost.

   b) ________________________________

   c) Write a rule for her profit (revenue - cost).

   c) ________________________________

   d) If she sells 6 skateboards in one month, write how much the following will be:

   i. Revenue

   ii. Cost

   iii. Profit

   e) How many skateboards will she have to sell in order to break even (revenue = cost)? Explain how you got your solution.
2) A hot dog vendor has studied his revenue \( R(x) \) and cost \( C(x) \) over the course of a month, each depends on the number of hot-dogs he sells. The following algebraic rules represent these two relationships where \( x \) represents the number of hot-dogs sold with revenue and costs measured in dollars.

\[
R(x) = 1.75x \\
C(x) = 125 + .45x
\]

a) What can you tell about this situation from the revenue rule?

b) What can you tell about this situation from the cost rule?

c) What would be the profit rule? Explain how you arrived at this rule.

d) How many hot-dogs would he have to sell in order to break even?

e) What would happen to the revenue rule if the vendor decided to sell hot-dogs for $1.00? Explain how this change would affect the break-even point.

f) Find this new breakeven point.
Notes - Breakeven

1) Jesse wants to start a business making and selling skateboards. She will charge $75 for each one. Her cost will be $30 per skateboard for materials. She must pay $500 per month rent (which includes utilities) so that she has a place to make and sell the skateboards.

a) Write a rule for her revenue (money coming in). 
\[ R(x) = 75x \]

b) Write a rule for her cost. 
\[ C(x) = 30x + 500 \]
Notes - Breakeven

c) Write a rule for her profit (revenue - cost).
\[ P(x) = 75x - 30x - 500 \]
\[ P(x) = 45x - 500 \]

d) If she sells 6 skateboards in one month, write how much the following will be:

i. Revenue $450.00

ii. Cost $680.00

iii. Profit $230.00
Notes - Breakeven

e) How many skateboards will she have to sell in order to break even (revenue = cost)? Explain how you got your solution.

\[ R(x) = 75x \]
\[ C(x) = 30x + 500 \]

\[ x = 12 \text{ skateboards} \]
Notes - Breakeven

2) A hot dog vendor has studied his revenue \( R(x) \) and cost \( C(x) \) over the course of a month; each depends on the number of hot-dogs he sells. The following algebraic rules represent these two relationships where \( x \) represents the number of hot-dogs sold with revenue and costs measured in dollars.

\[
R(x) = 1.75x \\
C(x) = 125 + .45x 
\]

a) What can you tell about this situation from the revenue rule?

\[\text{Charges } \$1.75 \text{ per hot dog}\]

b) What can you tell about this situation from the cost rule?

\[\text{Cost him } \$.45 \text{ per hot dog} + \$125 \text{ rental fee}\]
c) What would be the profit rule? Explain how you arrived at this rule.

\[ P(x) = \$1.30x - 12.5 \quad R(x) - C(x) \]

d) How many hot-dogs would he have to sell in order to break even?

97 hot dogs
Notes - Breakeven

e) What would happen to the revenue rule if the vendor decided to sell hot-dogs for $1.00? Explain how this change would affect the break-even point.

\[ R(x) = 1.00x \]

f) Find this new breakeven point.

\[ \frac{1}{x} = \frac{0.45}{125} \quad \text{or} \quad x = 228 \text{ hot dogs} \]
Homework - Breakeven

Systems and Writing Linear Equations IP

Solve each system by graphing.

1) \[ y = \frac{1}{2}x + 3 \]
   \[ y = \frac{1}{2}x - 1 \]

2) \[ y = x - 2 \]
   \[ y = 7x + 4 \]

Solve each system by substitution.

3) \[ y = -2x - 20 \]
   \[ y = x + 4 \]

4) \[ y = -5x - 4 \]
   \[ y = -6x - 5 \]

5) \[ y = 5x - 12 \]
   \[ -x - 7y = 12 \]

6) \[ 7x - 7y = 0 \]
   \[ y = -5x \]
Homework - Breakeven

Write the slope-intercept form of the equation of the line through the given point with the given slope.

7) through: \((-1, 2)\), slope = \(-3\)

Write the slope-intercept form of the equation of the line through the given points.

8) through: \((5, 5)\) and \((2, -1)\)

Write the slope-intercept form of the equation of the line described.

9) through: \((-2, 0)\), parallel to \(y = -\frac{5}{2}x + 3\)

10) through: \((-3, -1)\), perp. to \(y = -\frac{3}{4}x + 2\)
# Homework Solutions - Breakeven

**Answers to Systems and Writing Linear Equations IP**

1) \((4, 1)\)  
2) \((-1, -3)\)  
3) \((-8, -4)\)  
4) \((-1, 1)\)  
5) \((2, -2)\)  
6) \((0, 0)\)  
7) \(y = -3x - 1\)  
8) \(y = 2x - 5\)  
9) \(y = \frac{5}{2}x - 5\)  
10) \(y = \frac{4}{3}x + 3\)
1) (4, 1)  
2) (−1, −3)  
3) (−8, −4)  
4) (−1, 1)  
5) (2, −2)  
6) (0, 0)  
7) \( y = −3x − 1 \)  
8) \( y = 2x − 5 \)  
9) \( y = \frac{5}{2}x − 5 \)  
10) \( y = \frac{4}{3}x + 3 \)
2) \[ y = x - 2 \]
\[ y = 7x + 4 \]

\((-1, -3)\)
6) \( 7x - 7(-5x) = 0 \)
\[
y = -5x
\]
\[
7x + 35x = 0
\]
\[
\sqrt{2}x = 0
\]
\[
x = 0
\]
\[
(0,0)
\]
Write the slope-intercept form of the equation of the line through the given points.

8) through: (5, 5) and (2, -1)

\[ m = 2 \]

\[ y = 2(x - 2) - 1 \]

\[ y = 2x - 4 - 1 \]

\[ y = 2x - 5 \]
10) through: \((-3, -1)\), perp. to \(y = -\frac{3}{4}x + 2\)

\[ m = \frac{4}{3} \]

\[ y = \frac{4}{3}(x+3) - 1 \]

\[ y = \frac{4}{3}x + 4 - 1 \]
3-2

Study Guide and Intervention (continued)

Solving Systems of Equations Algebraically

Elimination To solve a system of linear equations by elimination, add or subtract the equations to eliminate one of the variables. You may first need to multiply one or both of the equations by a constant so that one of the variables has the same (or opposite) coefficient in one equation as it has in the other.

**Example**

Use the elimination method to solve the system of equations.

\[
\begin{align*}
2x - 4y &= -26 \\
3x - y &= -24
\end{align*}
\]

Multiply the second equation by 4. Then subtract the equations to eliminate the \( y \) variable.

\[
\begin{align*}
2x - 4y &= -26 \\
12x - 4y &= -96
\end{align*}
\]

\[
\begin{align*}
-10x &= 70 \\
x &= -7
\end{align*}
\]

Replace \( x \) with \(-7\) and solve for \( y \).

\[
\begin{align*}
2x - 4y &= -26 \\
2(-7) - 4y &= -26 \\
-14 - 4y &= -26 \\
-4y &= -12 \\
y &= 3
\end{align*}
\]

The solution is \((-7, 3)\).

**Example**

Use the elimination method to solve the system of equations.

\[
\begin{align*}
3x - 2y &= 4 \\
5x + 3y &= -25
\end{align*}
\]

Multiply the first equation by 3 and the second equation by 2. Then add the equations to eliminate the \( y \) variable.

\[
\begin{align*}
9x - 6y &= 12 \\
10x + 6y &= -50
\end{align*}
\]

\[
\begin{align*}
19x &= -38 \\
x &= -2
\end{align*}
\]

Replace \( x \) with \(-2\) and solve for \( y \).

\[
\begin{align*}
3x - 2y &= 4 \\
3(-2) - 2y &= 4 \\
-6 - 2y &= 4 \\
-2y &= 10 \\
y &= -5
\end{align*}
\]

The solution is \((-2, -5)\).

**Exercises**

Solve each system of equations by using elimination.

1. \( \begin{align*}
2x - y &= 7 \\
3x + y &= 8
\end{align*} \)

2. \( \begin{align*}
x - 2y &= 4 \\
-x + 6y &= 12
\end{align*} \)

3. \( \begin{align*}
3x + 4y &= -10 \\
x - 4y &= 2
\end{align*} \)

4. \( \begin{align*}
3x - y &= 12 \\
5x + 2y &= 20
\end{align*} \)

5. \( \begin{align*}
4x - y &= 6 \\
2x - \frac{y}{2} &= 4
\end{align*} \)

6. \( \begin{align*}
5x + 2y &= 12 \\
-6x - 2y &= -14
\end{align*} \)

7. \( \begin{align*}
2x + y &= 8 \\
3x + \frac{3}{2}y &= 12
\end{align*} \)

8. \( \begin{align*}
7x + 2y &= -1 \\
4x - 3y &= -13
\end{align*} \)

9. \( \begin{align*}
3x + 8y &= -6 \\
x - y &= 9
\end{align*} \)

10. \( \begin{align*}
5x + 4y &= 12 \\
7x - 6y &= 40
\end{align*} \)

11. \( \begin{align*}
-4x + y &= -12 \\
4x + 2y &= 6
\end{align*} \)

12. \( \begin{align*}
5m + 2n &= -8 \\
4m + 3n &= 2
\end{align*} \)
Word Problem Practice
Solving Systems of Equations Algebraically

1. SUPPLIES Kirsta and Arthur both need pens and blank CDs. The equation that represents Kirsta's purchases is \( y = 27 - 3x \). The equation that represents Arthur's purchases is \( y = 17 - x \). If \( x \) represents the price of the pens, and \( y \) represents the price of the CDs, what are the prices of the pens and the CDs?

2. WALKING Amy is walking a straight path that can be represented by the equation \( y = 2x + 3 \). At the same time Kendra is walking the straight path that has the equation \( 3y = 6x + 6 \). What is the solution to the system of equations that represents the paths the two girls walked? Explain.

3. CAFETERIA To furnish a cafeteria, a school can spend $5200 on tables and chairs. Tables cost $200 and chairs cost $40. Each table will have 8 chairs around it. How many tables and chairs will the school purchase?

4. PRICES At a store, toothbrushes cost \( x \) dollars and bars of soap cost \( y \) dollars. One customer bought 2 toothbrushes and 1 bar of soap for $11. Another customer bought 6 toothbrushes and 5 bars of soap for $38. Both amounts do not include tax. Write and solve a system of equations for \( x \) and \( y \).

GAMES For Exercises 5–7, use the following information.
Mark and Stephanie are playing a game where they toss a dart at a game board that is hanging on the wall. The points earned from a toss depends on where the dart lands. The center area is worth more points than the surrounding area. Each player tosses 12 darts.

5. Stephanie earned a total of 66 points with 6 darts landing in each area. Mark earned a total of 56 points with 4 darts landing in the center area, and 8 darts landing in the surrounding area. Write a system of equations that represents the number of darts each player tossed into each section. Use \( x \) for the inner circle, and \( y \) for the outer circle.

6. How many points is the inner circle worth? How many points is the outer circle worth?

7. If a player gets 10 darts in the inner circle and 2 in the outer circle the total score is doubled. How many points would the player earn if he or she gets exactly 10 darts in the center?
\[ 2x - 4y = -26 \]
\[-y(3x - y = -24) \]
\[ 2x - 4y = -26 \]
\[-12x + 4y = 96 \]
\[ y = 3(-7) + 24 \]
\[ y = -21 + 24 \]
\[ y = 3 \]
\[ (-7, 3) \]
\[ -10x = 70 \]
\[ x = -7 \]
\[3(3x - 2y = 4)\]
\[2(5x + 3y = -25)\]

\[
\begin{align*}
9x - 6y &= 12 \\
10x + 6y &= -50 \\
19x &= -38 \\
x &= -2
\end{align*}
\]

\[
\begin{align*}
3(-2) - 2y &= 4 \\
-6 - 2y &= 4 \\
-6 - 4 &= 2y \\
-10 &= 2y \\
y &= -5
\end{align*}
\]
Solve each system of equations by using elimination.

1. \[2x - y = 7\]
   \[3x + y = 8\]
   \((3, -1)\)

2. \[x - 2y = 4\]
   \[-x + 6y = 12\]
   \((12, 4)\)

3. \[3x + 4y = -10\]
   \[x - 4y = 2\]
   \((-2, -1)\)

4. \[3x - y = 12\]
   \[5x + 2y = 20\]
   \((4, 0)\)

5. \[4x - y = 6\]
   \[2x - \frac{y}{2} = 4\]
   no solution

6. \[5x + 2y = 12\]
   \[-6x - 2y = -14\]
   \((2, 1)\)

7. \[2x + y = 8\]
   \[3x + \frac{3}{2}y = 12\]
   infinitely many

8. \[7x + 2y = -1\]
   \[4x - 3y = -13\]
   \((-1, 3)\)

9. \[3x + 8y = -6\]
   \[x - y = 9\]
   \((6, -3)\)

10. \[5x + 4y = 12\]
    \[7x - 6y = 40\]
    \((4, -2)\)

11. \[-4x + y = -12\]
    \[4x + 2y = 6\]
    \((\frac{5}{2}, -2)\)

12. \[5m + 2n = -8\]
    \[4m + 3n = 2\]
    \((-4, 6)\)

Chapter 3

Glencoe Algebra 2
1. SUPPLIES Kirsta and Arthur both need pens and blank CDs. The equation that represents Kirsta's purchases is \( y = 27 - 3x \). The equation that represents Arthur's purchases is \( y = 17 - x \). If \( x \) represents the price of the pens, and \( y \) represents the price of the CDs, what are the prices of the pens and the CDs?

**pens are $5 a pack, CDs are $12 a pack**

2. WALKING Amy is walking a straight path that can be represented by the equation \( y = 2x + 3 \). At the same time Kendra is walking the straight path that has the equation \( 3y = 6x + 6 \). What is the solution to the system of equations that represents the paths the two girls walked? Explain.

**There is no solution. Their paths never cross.**

3. CAFETERIA To furnish a cafeteria, a school can spend $5200 on tables and chairs. Tables cost $200 and chairs cost $40. Each table will have 8 chairs around it. How many tables and chairs will the school purchase?

**10 tables and 80 chairs**

4. PRICES At a store, toothbrushes cost \( x \) dollars and bars of soap cost \( y \) dollars.

---

**GAMES** For Exercises 5–7, use the following information.

Mark and Stephanie are playing a game where they toss a dart at a game board that is hanging on the wall. The points earned from a toss depends on where the dart lands. The center area is worth more points than the surrounding area. Each player tosses 12 darts.

5. Stephanie earned a total of 66 points with 6 darts landing in each area. Mark earned a total of 56 points with 4 darts landing in the center area, and 8 darts landing in the surrounding area. Write a system of equations that represents the number of darts each player tossed into each section. Use \( x \) for the inner circle, and \( y \) for the outer circle.

\[ 6x + 6y = 66; \ 4x + 8y = 56 \]

6. How many points is the inner circle worth? How many points is the outer circle worth?

**inner circle = 8 points; outer circle = 3 points**
\[
\begin{align*}
10 \cdot (5x + 4y &= 12) \\
2 \cdot (7x - 6y &= 40)
\end{align*}
\]

\[
\begin{align*}
15x + 12y &= 36 \\
14x - 12y &= 80
\end{align*}
\]

\[
29x = 116
\]

\[
x = 4
\]

\[
5(4) + 4y = 12 \\
20 + 4y = 12 \\
y = -2
\]
Find the Slope between these two points. Then write the equation of the line in slope-intercept form.

\((-3, 8) \quad (5, 10)\)

\[ m = \frac{10 - 8}{5 - (-3)} = \frac{1}{4} \]

\[ y = \frac{1}{4} (x + 3) + 8 \]

\[ y = \frac{1}{4} x + \frac{3}{4} + 8 \]

\[ y = \frac{1}{4} x + \frac{35}{4} \] or \[ y = \frac{1}{4} x + 8.75 \]
One Solution

Two lines intersect
Different slopes

No Solution

Parallel lines
Same slope
Different y-intercept

Infinitely Many Solutions

Same line
Same slope
Same y-intercept
Practice - Applications
Wednesday, September 23, 2015

Applications of Systems
Algebra 2, 3.1-3.3

Without graphing, describe the relationship of the graphs of the equations. Tell whether the system has no
solution, one solution, or infinite solutions.

1. \( y = 2x + 1 \)
   \( y = 2x - 5 \)

2. \( b = -3a + 2 \)
   \( b = 3a + 2 \)

3. \( u - 2v = 10 \)
   \( 3u - 6v = 30 \)

4. \( 2m - 5n = -3 \)
   \( -3m + 5n = -3 \)

5. \( 3f - 2g = 12 \)
   \( 3f + 2g = 12 \)

6. \( 9y = 6x - 15 \)
   \( -3y = -2y + 5 \)

Find \( x \) and \( y \) in each situation.

13. \( x^2 + y^2 = 150^2 \)

14. \( x + y = 4500 \)
   \( 3x + 2y = 11,100 \)

15. \( x = \text{run 6m/hr} \)
   \( y = \text{run 8m/hr} \)
   \( 0.85x + 0.60y = 50 \)

16. Ten years ago Cleon and Kaneshi Ray invested $4500 in two
    companies: Cyberdyne and Compunetics. The Cyberdyne stock
    tripled and the Compunetics stock doubled, and now their
    investment is worth $11,100. How much did they invest in
    each company?

17. One day, Ji Hoon Kwon’s grocery store sold 70 bars of soap, some
    for $0.85, some with a 25-cent-off coupon for $0.60. A total of $50
    was taken in from the sale of bars of soap, but the cashier lost the
    coupons. How many bars of soap were sold with coupons?

18. Julietta Guzman ran a marathon of 26 miles in 3.5 h. During part
    of the race she ran at 6 mi/h, and for the rest of the time she ran at
    8 mi/h. How long did she run at each speed?

19. Jung Moe is planning a summer vacation trip that includes
    600 miles of driving per week. If she rents a car at U-Drive-It
    Rent-a-Car, she will pay $130 per week. At FastLane Rent-a-Car
    there is a one-time charge of $280 plus $15 per mile.

   a. Let \( w \) be the number of weeks that Jung Moe drives. Write an
      equation for the cost of renting a car from U-Drive-It.
   b. Write an equation for the cost of renting from FastLane.
   c. Solve the system by graphing.
   d. Based on the graph, how should Jung Moe decide between the
      two companies?

C = 130w
C = 90w + 280
Find $x$ and $y$ in each situation.

13. \[
\begin{align*}
2x + y &= 180 \\
x + 3y &= 180
\end{align*}
\]
\[
\begin{align*}
x &= 72 \\
y &= 36
\end{align*}
\]

14. \[
\begin{align*}
-x + 2y &= 180 \\
x + y &= 150
\end{align*}
\]
\[
\begin{align*}
y &= 110 \\
x &= 40
\end{align*}
\]

15. \[
\begin{align*}
x + 4y &= 35 \\
x - y &= 5y - x
\end{align*}
\]
\[
2x - 6y = 0
\]
Rally Coach

Thursday, September 24, 2015

Algebra 2/2 AB
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Rally Coach - SOE

Solve each system by graphing.

1) \( y = \frac{1}{2}x + 3 \)
   \( y = 4x - 4 \)

2) \( y = \frac{1}{2}x - 4 \)
   \( y = -\frac{3}{4}x + 1 \)

Solve each system by substitution.

3) \( y = -2x + 5 \)
   \( -3x + 2y = 3 \)

4) \( -2x + 2y = -14 \)
   \( y = -6x + 14 \)

Solve each system by elimination.

5) \( 10x - 7y = -3 \)
   \( 5x - 8y = 3 \)

6) \( 4x + 18y = 10 \)
   \( x - 9y = 16 \)
Answers to Rally Coach - SOE

1) (2, 4)  2) (4, -2)  3) (1, 3)
5) (-1, -1)  6) (7, -1)  4) (3, -4)
1. The lines of sight to a forest fire are as follows.

   From Ranger Station A: $3x + y = 9$
   From Ranger Station B: $2x + 3y = 13$

Find the coordinates of the fire.
2. An airplane is traveling along the line $x - y = -1$ when it sees another airplane traveling along the line $5x + 3y = 19$. If they continue along the same lines, at what point will their flight paths cross?
3. Two mine shafts are dug along the paths of the following equations.

\[ x - y = 1400 \]
\[ 2x + y = 1300 \]

If the shafts meet at a depth of 200 feet, what are the coordinates of the point at which they meet?
25. The sum of two numbers is 12. The difference of the same two numbers is \(-4\). Find the numbers.

\[
\begin{align*}
x + y &= 12 \\
x - y &= -4
\end{align*}
\]
26. Twice a number minus a second number is $-1$. Twice the second number added to three times the first number is 9. Find the two numbers.

$$2x - y = -1$$
$$3x + 2y = 9$$
Last year the volleyball team paid $5 per pair for socks and $17 per pair for shorts on a total purchase of $315. This year they spent $342 to buy the same number of pairs of socks and shorts because the socks now cost $6 a pair and the shorts cost $18.

28. Write a system of two equations that represents the number of pairs of socks and shorts bought each year.

29. How many pairs of socks and shorts did the team buy each year?

\[5s + 17e = 315\]
\[6s + 18e = 342\]
1. The lines of sight to a forest fire are as follows.
   - From Ranger Station A: $3x + y = 9$
   - From Ranger Station B: $2x + 3y = 13$
   Find the coordinates of the fire.

2. An airplane is traveling along the line $x - y = -1$ when it sees another airplane traveling along the line $5x + 3y = 19$. If they continue along the same lines, at what point will their flight paths cross?

3. Two mine shafts are dug along the paths of the following equations.
   - $x - y = 1400$
   - $2x + y = 1300$
   If the shafts meet at a depth of 200 feet, what are the coordinates of the point at which they meet?
25. The sum of two numbers is 12. The difference of the same two numbers is −4. Find the numbers.

26. Twice a number minus a second number is −1. Twice the second number added to three times the first number is 9. Find the two numbers.

Last year the volleyball team paid $5 per pair for socks and $17 per pair for shorts on a total purchase of $315. This year they spent $342 to buy the same number of pairs of socks and shorts because the socks now cost $6 a pair and the shorts cost $18.

28. Write a system of two equations that represents the number of pairs of socks and shorts bought each year.

29. How many pairs of socks and shorts did the team buy each year?
1. \( f(x) = \begin{cases} 
-x & \text{if } x \leq 2 \\
x & \text{if } x > 2 
\end{cases} \)

2. \( f(x) = \begin{cases} 
2 & \text{if } x > -3 \\
-5 & \text{if } x < -3 
\end{cases} \)

3. \( f(x) = \begin{cases} 
-1 & \text{if } x \leq -2 \\
2 & \text{if } x > -2 
\end{cases} \)

4. \( f(x) = \begin{cases} 
-1 & \text{if } x \leq -1 \\
1 & \text{if } -1 < x < 1 \\
x & \text{if } x > 1 
\end{cases} \)

5. \( f(x) = \begin{cases} 
-x + 2 & \text{if } x \leq 0 \\
\frac{1}{2} x + 3 & \text{if } x > 0 
\end{cases} \)

6. \( f(x) = \begin{cases} 
x + 2 & \text{if } x \leq 2 \\
\frac{1}{2} x + 4 & \text{if } x > 2 
\end{cases} \)
7. \[ f(x) = \begin{cases} 
-3x - 4, & x \leq -2 \\
-x + 1, & x > -2 
\end{cases} \]

8. \[ f(x) = \begin{cases} 
-x, & x \leq 0 \\
2x - 2, & x > 0 
\end{cases} \]

9. \[ f(x) = \begin{cases} 
-x - 4, & x < -2 \\
-\frac{1}{2}x, & -2 \leq x \leq 2 \\
-1, & x > 2 
\end{cases} \]

10. \[ f(x) = \begin{cases} 
3, & x < -1 \\
x + 1, & 1 \leq x \leq 4 
\end{cases} \]

11. \[ f(x) = \begin{cases} 
\frac{1}{2} x - 1, & x \neq 4 \\
3, & x = 4 
\end{cases} \]

12. \[ f(x) = \begin{cases} 
x + 4, & -6 \leq x < 2 \\
-6, & x = 2 \\
-x + 2, & x > 2 
\end{cases} \]
1. \( f(x) = \begin{cases} 
-x & \text{if } x \leq 2 \\
2 & \text{if } x > 2 
\end{cases} \)
2. \[ f(x) = \begin{cases} 
2, & x > -3 \\
-5, & x < -3 
\end{cases} \]
4. \[ f(x) = \begin{cases} 
-1, & x \leq -1 \\
1, & -1 < x < 1 \\
x, & x > 1 
\end{cases} \]
Algebra 2:
Graphing Piecewise Functions Worksheet

1. \( f(x) = \begin{cases} -x & \text{if } x \leq 2 \\ 2 & \text{if } x > 2 \end{cases} \)
   \[ y = \frac{-x}{1} + 0 \]
   \[ y = \frac{2}{1} + 0 \]

2. \( f(x) = \begin{cases} 2 & \text{if } x > -3 \\ -5 & \text{if } x < -3 \end{cases} \)
   \[ y = 2 \]
   \[ y = -5 \]

3. \( f(x) = \begin{cases} -1 & \text{if } x \leq -2 \\ 2 & \text{if } x > -2 \end{cases} \)
   \[ y = -1 \]
   \[ y = 2 \]

4. \( f(x) = \begin{cases} -1 & \text{if } x \leq -1 \\ 1 & \text{if } -1 < x < 1 \\ 0 & \text{if } x > 1 \end{cases} \)

5. \( f(x) = \begin{cases} -x + 2 & \text{if } x \leq 0 \\ 1 & \text{if } x > 0 \end{cases} \)

6. \( f(x) = \begin{cases} x + 2 & \text{if } x \leq 2 \\ \frac{1}{2}x + 4 & \text{if } x > 2 \end{cases} \)
7. \( f(x) = \begin{cases} 
-3x - 4, & x \leq -2 \\
x + 1, & x > -2 
\end{cases} \)

8. \( f(x) = \begin{cases} 
-x, & x \leq 0 \\
2x - 2, & x > 0 
\end{cases} \)

9. \( f(x) = \begin{cases} 
-x - 4, & x < -2 \\
-x + 2, & -2 \leq x \leq 2 \\
-1, & x > 2 
\end{cases} \)

10. \( f(x) = \begin{cases} 
3, & x < -1 \\
x + 1, & 1 \leq x \leq 4 
\end{cases} \)

11. \( f(x) = \begin{cases} 
\frac{x}{2} - 1, & x \neq 4 \\
3, & x = 4 
\end{cases} \)

12. \( f(x) = \begin{cases} 
x + 4, & -6 \leq x < 2 \\
-6, & x = 2 \\
-x + 2, & x > 2 
\end{cases} \)
Sketch the graph of each linear inequality.

1) \( y < \frac{1}{5}x - 1 \)

2) \( y \geq \frac{6}{5}x - 2 \)

3) \( y > 2x + 1 \)

4) \( y < -\frac{2}{3}x + 3 \)

5) \( y > -\frac{1}{2}x + 1 \)

6) \( y \leq -\frac{5}{2}x + 2 \)
7) \( x + y \geq 2 \)

8) \( x - 3y \leq -9 \)

9) \( x + 3y > 3 \)

10) \( x + y \leq 1 \)

Sketch the graph of each function.

11) \( y \geq x^2 + 6x + 10 \)

12) \( y > x^2 - 6x + 12 \)
1) \( y < -\frac{1}{5}x - 1 \)

Graph:

- Region above the line where \( y > -\frac{1}{5}x - 1 \)
- Region below the line where \( y < -\frac{1}{5}x - 1 \)

Points:

- Point (0, -1)
- Point (-5, -1)

Inequality:

- \(-5 < -1\)
2) \( y \geq \frac{6}{5}x - 2 \)
3) $y > 2x + 1$
6) \( y \leq -\frac{5}{2}x + 2 \)
6) \( y \leq -\frac{5}{2}x + 2 \)
Day 10

Graphing Inequalities

10) \( x + y \leq 1 \)

\( y \leq -x + 1 \)
12) $y > x^2 - 6x + 12$

$\frac{6}{2(1)} = (3, 3)$

$9 - 18 + 12$
Sketch the graph of each linear inequality.

1) \( y > 6x + 3 \)

2) \( y \geq \frac{5}{2}x - 5 \)

3) \( y \leq \frac{3}{5}x + 5 \)

4) \( y > -6x - 1 \)

5) \( y \leq \frac{2}{5}x - 2 \)

6) \( y \geq \frac{1}{4}x + 4 \)
7) \(4x + y \geq -5\)

8) \(2x - y < -4\)

9) \(4x + 3y < 6\)

10) \(4x - y < -3\)

Sketch the graph of each function.

11) \(y < x^2 + 4x + 5\)

12) \(y \geq x^2 + 6x + 12\)
Answers to Graphing Inequalities

1) 

2) 

3) 

4) 

5) 

6) 

7) 

8) 

9) 

10) 

11) 

12)

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Solve each system by graphing.

1) \( y = -3x + 3 \)
   \( y = \frac{1}{2}x - 4 \)

2) \( y = -2x - 1 \)
   \( y = -2x - 4 \)

Solve each system by substitution.

3) \( -x - 7y = -20 \)
   \( y = 2x - 10 \)

4) \( -6x + 2y = 18 \)
   \( y = 6x + 15 \)

Solve each system by elimination.

5) \( 5x + 9y = 6 \)
   \( -3x + 3y = -12 \)

6) \( 5x - 4y = 18 \)
   \( -4x + 8y = 0 \)
Answers to SOE More Practice

1) (2, -3)  
2) No solution  
3) (6, 2)  
4) (-2, 3)  
5) (3, -1)  
6) (6, 3)
Sketch the graph of each linear inequality.

1) \( y < -2x + 1 \)

2) \( 3x - y < -5 \)

Write the slope-intercept form of the equation of the line through the given point with the given slope.

3) through: \((-4, -1)\), slope = \(\frac{5}{4}\)

Write the slope-intercept form of the equation of the line through the given points.

4) through: \((-5, 1)\) and \((-1, 3)\)

Write the slope-intercept form of the equation of the line described.

5) through: \((4, 2)\), parallel to \(y = -\frac{3}{2}x + 4\)

6) through: \((-2, 5)\), perp. to \(y = \frac{1}{5}x - 1\)
Solve each system by graphing.

7) \( y = -\frac{7}{4}x + 4 \)
   \( y = -\frac{1}{4}x - 2 \)

Solve each system by elimination.

8) \(-10x + 5y = 10\)
   \(-5x - 3y = 27\)

Solve each system by substitution.

9) \(-8x - 8y = 8\)
   \(y = -3x - 7\)
Answers to Review

1) $y = \frac{1}{2}x + \frac{7}{2}$

2) $y = -\frac{3}{2}x + 8$

3) $y = \frac{5}{4}x + 4$

4) $(-3, -4)$

5) $(-3, 2)$

6) $y = -5x - 5$

7) $(4, -3)$
2) $3x - y < -5$

\[ \frac{3x - y}{-1} < \frac{-5}{-1} \]

\[ y > 3x + 5 \]
Solve each system by elimination.

8) \(-10x + 5y = 10\)
   \(-2(-5x - 3y = 27)\)

\[
\begin{align*}
-10x + 5y &= 10 \\
10x + 6y &= 54 \\
11y &= -44 \\
y &= -4 \\
x &= -3
\end{align*}
\]

\((-3, -4)\)
Solve each system by substitution.

9) \[ \begin{align*}
8x - 8y &= 8 \quad \text{divided by} \quad -1 \\
y &= -3x - 7
\end{align*} \]

\[
\begin{align*}
x + (-3x - 7) &= -1 \\
x - 3x - 7 &= -1 \\
-2x &= 6 \\
x &= -3
\end{align*}
\]

\[
\begin{align*}
y &= -3(-3) - 7 \\
y &= 9 - 7 \\
y &= 2
\end{align*}
\]

Solution: \((-3, 2)\)
3-4

Study Guide and Intervention
Linear Programming

Maximum and Minimum Values  When a system of linear inequalities produces a bounded polygonal region, the maximum or minimum value of a related function will occur at a vertex of the region.

Example  Graph the system of inequalities. Name the coordinates of the vertices of the feasible region. Find the maximum and minimum values of the function \( f(x, y) = 3x + 2y \) for this polygonal region.

\[
\begin{align*}
  y &\leq 4 \\
  y &\leq -x + 6 \\
  y &\geq \frac{1}{2}x - \frac{3}{2} \\
  y &\leq 6x + 4
\end{align*}
\]

First find the vertices of the bounded region. Graph the inequalities.
The polygon formed is a quadrilateral with vertices at (0, 4), (2, 4), (5, 1), and (-1, -2). Use the table to find the maximum and minimum values of \( f(x, y) = 3x + 2y \).

<table>
<thead>
<tr>
<th>( (x, y) )</th>
<th>( 3x + 2y )</th>
<th>( f(x, y) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0, 4)</td>
<td>3(0) + 2(4)</td>
<td>8</td>
</tr>
<tr>
<td>(2, 4)</td>
<td>3(2) + 2(4)</td>
<td>14</td>
</tr>
<tr>
<td>(5, 1)</td>
<td>3(5) + 2(1)</td>
<td>17</td>
</tr>
<tr>
<td>(-1, -2)</td>
<td>3(-1) + 2(-2)</td>
<td>-7</td>
</tr>
</tbody>
</table>

The maximum value is 17 at (5, 1). The minimum value is -7 at (-1, -2).

Exercises

Graph each system of inequalities. Name the coordinates of the vertices of the feasible region. Find the maximum and minimum values of the given function for this region.

1. \( y \geq 2 \)
   \( 1 \leq x \leq 5 \)
   \( y \leq x + 3 \)
   \( f(x, y) = 3x - 2y \)

2. \( y \geq -2 \)
   \( y \geq 2x - 4 \)
   \( x - 2y \geq -1 \)
   \( f(x, y) = 4x - y \)

3. \( x + y \geq 2 \)
   \( 4y \geq x + 8 \)
   \( y \geq 2x - 5 \)
   \( f(x, y) = 4x + 3y \)
1. \( y \geq 2 \)
   \( 1 \leq x \leq 5 \)
   \( y \leq x + 3 \)
   \[ f(x, y) = 3x - 2y \]

\[ (1, 2) \]
\[ (1, 4) \]
\[ (5, 2) \]
\[ (5, 8) \]

\[ 3(1) - 2(2) = -1 \]
\[ 3(1) - 2(4) = -5 \text{ Min} \]
\[ 3(5) - 2(2) = 11 \text{ Max} \]
\[ 3(5) - 2(8) = -1 \]
2. \[ y \geq -2 \]
\[ y \geq 2x - 4 \]
\[ x - 2y \geq -1 \]
\[ f(x, y) = 4x - y \]

\[ y \leq \frac{1}{2}x + \frac{1}{2} \]

\[ (3, 2) \quad y(3) - 2 = 10 \quad \text{Max} \]
\[ (1, -2) \quad y(1) - (-2) = 6 \]
\[ (-5, -2) \quad y(-5) - (-2) = -18 \quad \text{Min} \]
3. $x + y \geq 2$
   $4y \leq x + 8$
   $y \geq 2x - 5$

$f(x, y) = 4x + 3y$

$y \geq -x + 2$
$y \leq \frac{1}{4}x + 2$
Graph each system of inequalities. Name the coordinates of the vertices of the feasible region. Find the maximum and minimum values of the given function for this region.

1. \( x \geq 2 \)
   \( x \leq 5 \)
   \( y \geq 1 \)
   \( y \leq 4 \)
   \( f(x, y) = x + y \)

2. \( x \geq 1 \)
   \( y \leq 6 \)
   \( y \geq x - 2 \)
   \( f(x, y) = x - y \)

3. \( x \geq 0 \)
   \( y \geq 0 \)
   \( y \leq 7 - x \)
   \( f(x, y) = 3x + y \)

4. \( x \geq -1 \)
   \( x + y \leq 6 \)
   \( f(x, y) = x + 2y \)

5. \( y \leq 2x \)
   \( y \geq 6 - x \)
   \( y \leq 6 \)
   \( f(x, y) = 4x + 3y \)

6. \( y \geq -x - 2 \)
   \( y \geq 3x + 2 \)
   \( y \leq x + 4 \)
   \( f(x, y) = -3x + 5y \)

7. MANUFACTURING A backpack manufacturer produces an internal frame pack and an external frame pack. Let \( x \) represent the number of internal frame packs produced in one hour and let \( y \) represent the number of external frame packs produced in one hour. Then the inequalities \( x + 3y \leq 18 \), \( 2x + y \leq 16 \), \( x \geq 0 \), and \( y \geq 0 \) describe the constraints for manufacturing both packs. Use the profit function \( f(x) = 50x + 80y \) and the constraints given to determine the maximum profit for manufacturing both backpacks for the given constraints.
1. \( x \geq 2 \)
   \( x \leq 5 \)
   \( y \geq 1 \)
   \( y \leq 4 \)
   \( f(x, y) = x + y \)

max.: 9, min.: 3
4. \( x \geq -1 \)
\[ x + y \leq 6 \]
\[ f(x, y) = x + 2y \]

\((-1, 7) + 2(7) = 13\)

\(5 \leq -x + 6\)
\((-1, 7)\)

max.: 13, no min.
6. \( y \geq -x - 2 \)
   \( y \geq 3x + 2 \)
   \( y \leq x + 4 \)
   \( f(x, y) = -3x + 5y \)

\[ (1, 5) \] \(-3(1) + 5(5) = 22 \]

max.: 22, min.: -2
1. $x \geq 2$
   $x \leq 5$
   $y \geq 1$
   $y \leq 4$
   $f(x, y) = x + y$
   max.: 9, min.: 3

2. $x \geq 1$
   $y \geq 6$
   $y \geq x - 2$
   $f(x, y) = x - y$
   max.: 2, min.: -5

3. $x \geq 0$
   $y \geq 0$
   $y \leq 7 - x$
   $f(x, y) = 3x + y$
   max.: 21, min.: 0

4. $x \geq -1$
   $x + y \leq 6$
   $f(x, y) = x + 2y$
   max.: 13, no min.

5. $y \leq 2x$
   $y \geq 6 - x$
   $y \leq 6$
   $f(x, y) = 4x + 3y$
   no max., min.: 20

6. $y \geq -x - 2$
   $y \geq 3x + 2$
   $y \leq x + 4$
   $f(x, y) = -3x + 5y$
   max.: 22, min.: -2
3-4 Skills Practice
Linear Programming

Graph each system of inequalities. Name the coordinates of the vertices of the feasible region. Find the maximum and minimum values of the given function for this region.

1. \( x \geq 2 \)
   \( x \leq 5 \)
   \( y \geq 1 \)
   \( y \leq 4 \)
   \( f(x, y) = x + y \)

2. \( x \geq 1 \)
   \( y \leq 6 \)
   \( y \geq x - 2 \)
   \( f(x, y) = x - y \)

3. \( x \geq 0 \)
   \( y \geq 0 \)
   \( y \leq 7 - x \)
   \( f(x, y) = 3x + y \)

4. \( x \geq -1 \)
   \( x + y \leq 6 \)
   \( f(x, y) = x + 2y \)

5. \( y \leq 2x \)
   \( y \geq 6 - x \)
   \( y \leq 6 \)
   \( f(x, y) = 4x + 3y \)

6. \( y \geq -x - 2 \)
   \( y \geq 3x + 2 \)
   \( y \leq x + 4 \)
   \( f(x, y) = -3x + 5y \)

7. MANUFACTURING A backpack manufacturer produces an internal frame pack and an external frame pack. Let \( x \) represent the number of internal frame packs produced in one hour and let \( y \) represent the number of external frame packs produced in one hour. Then the inequalities \( x + 3y \leq 18 \), \( 2x + y \leq 16 \), \( x \geq 0 \), and \( y \geq 0 \) describe the constraints for manufacturing both packs. Use the profit function \( f(x) = 50x + 80y \) and the constraints given to determine the maximum profit for manufacturing both backpacks for the given constraints.

Chapter 3 30 Glencoe Algebra 2
Why Are There Rules in Croquet?

Solve each problem below using a system of two equations in two variables. Find the solution in the answer column and notice the three letters next to it. Write these letters in the three boxes at the bottom of the page that contain the number of that exercise.

1. The sum of two numbers is 90. Their difference is 18. Find the numbers.

2. The second of two numbers is 4 more than the first. The sum of the numbers is 56. Find the numbers.

3. The number of girls at Sky High School is 60 greater than the number of boys. If there are 1250 students all together, how many girls are there?

4. The second of two numbers is 5 more than twice the first. The sum of the numbers is 44. Find the numbers.

5. The sum of two numbers is 75. The second number is 3 less than twice the first. Find the numbers.

6. The larger of two numbers is 8 more than four times the smaller. If the larger is increased by four times the smaller, the result is 40. Find the numbers.

7. The number of calories in a piece of pie is 20 less than three times the number of calories in a scoop of ice cream. The pie and ice cream together have 500 calories. How many calories are in each?

8. The sum of two numbers is 4 less than twice the larger. If the larger is decreased by three times the smaller, the result is -20. Find the numbers.

| 660 | THE |
| 655 | WEC |
| 38, 52 | BEC |
| 16, 12 | DER |
| 24, 4 | LAW |
| 36, 54 | SOT |
| 635 | ITW |
| 16, 28 | ROQ |
| 13, 31 | ANH |
| 24, 32 | HER |
| 370, 130 | NOR |
| 26, 30 | HAT |
| 36, 39 | ITB |
| 350, 150 | YER |
| 26, 49 | AVE |

OBJECTIVE 6–e: To solve word problems using systems of equations.
Complete questions 1-4
Sketch the solution to each system of inequalities.

1) \[ y \geq \frac{4}{3}x + 3 \]
   \[ y > \frac{2}{3}x - 3 \]

2) \[ y \geq -\frac{4}{3}x + 2 \]
   \[ y < \frac{1}{3}x - 3 \]

3) \[ y \geq -x - 3 \]
   \[ y \geq 5x + 3 \]

4) \[ y \leq -x + 1 \]
   \[ x < -1 \]

5) \[ y < \frac{1}{2}x + 1 \]
   \[ y < 2x - 2 \]

6) \[ y \leq \frac{1}{2}x + 2 \]
   \[ y > 2x - 1 \]
7) \[ 4x + 3y \geq 3 \]
\[ x + 3y < -6 \]

8) \[ 2x + y \leq 1 \]
\[ x + 2y < -4 \]

9) \[ x + y \geq -3 \]
\[ 4x - y \geq -2 \]

10) \[ 3x + 2y > -4 \]
\[ x - 2y \geq -4 \]

11) \[ 2x + y \leq -3 \]
\[ 3x - y > -2 \]

12) \[ x - 3y \leq -6 \]
\[ 5x - 3y \geq 6 \]
Answers to System of Inequalities

1) 

2) 

3) 

4) 

5) 

6) 

7) 

8) 

9) 

10) 

11) 

12)
1) \( y \geq \frac{4}{3}x + 3 \)

\( y > -\frac{2}{3}x - 3 \)
2) \( y \geq -\frac{4}{3}x + 2 \)

\( y < \frac{1}{3}x - 3 \)
9) \( x + y \geq -3 \)
\( 4x - y \geq -2 \)

\[ y \geq -x - 3 \]
\[ y \leq 4x + 2 \]
11) \(2x + y \leq -3\)
\[3x - y > -2\]

\[\frac{y - (-2x - 3)}{1} = \frac{3x - 2}{1}\]
\[3x \geq -\frac{2 + y}{2}\]
\[y < 3x + 2\]
More practice with Piecewise Functions

Monday, October 05, 2015
Worksheet - Piecewise Functions

Evaluate the following for \( f(x) = \begin{cases} 3x - 5, & x > 4 \\ x^2, & x \leq 4 \end{cases} \):

1. \( f(7) \) 
2. \( f(4) \) 
3. \( f(-3) \)

Evaluate the following for \( f(x) = \begin{cases} -2|x + 1|, & x \leq 1 \\ 3, & 1 < x < 3 \\ 6 - 2x, & x \geq 3 \end{cases} \):

4. \( f(10) \) 
5. \( f(2) \) 
6. \( f(0) \)

Graph the following piecewise functions.

7. \( f(x) = \begin{cases} -2, & x < 0 \\ 3, & x \geq 0 \end{cases} \)

8. \( g(x) = \begin{cases} -x + 2, & x < 2 \\ x - 2, & x \geq 2 \end{cases} \)
9. \( h(x) = \begin{cases} 
-3x + 2, & x \leq 2 \\
\frac{1}{2}x - 4, & x > 2 
\end{cases} \)

10. \( f(x) = \begin{cases} 
4, & x \leq -2 \\
x^2, & -2 < x < 2 \\
4, & x \geq 2 
\end{cases} \)

11. \( g(x) = \begin{cases} 
3x + 12, & x \leq -3 \\
|x|, & -3 < x < 3 \\
-3x + 12, & x \geq 3 
\end{cases} \)

12. \( h(x) = \begin{cases} 
x^2 - 4, & x < 3 \\
\frac{2}{3}x - 5, & x \geq 3 
\end{cases} \)

13. Which of the piecewise functions are continuous?

14. Which of the piecewise functions are discontinuous?
Evaluate the following for $f(x) = \begin{cases} 3x - 5, & x > 4 \\ x^2, & x \leq 4 \end{cases}$:

1. $f(7) = 16$
2. $f(4) = 16$
3. $f(-3) = q$
Evaluate the following for \( f(x) = \begin{cases} 
-2|x + 1|, & x \leq 1 \\
3, & 1 < x < 3 \\
6 - 2x, & x \geq 3 
\end{cases} \):

4. \( f(10) = -14 \) 
5. \( f(2) = 3 \) 
6. \( f(0) = -2 \)
Finite Math B
3.2 Linear Programming

Worksheet 3.2 – Linear Programming

The following graphs show regions of feasible solutions. Use these regions to find maximum and minimum values of the given objective functions.

1) \( z = 3x + 2y \)

2) \( z = x - 4y \)

3) \( z = 0.35x + 1.25y \)

4) \( z = 1.5x - 0.5y \)
Find the Maximum or Minimum Value for the Objective Function for each set of constraints.

5. Maximize:
   \[ z = 8x + 2y \]
   Subject to:
   \[ 4x + 5y \leq 35 \]
   \[ x + 5y \leq 20 \]
   \[ y \geq 0 \]
   \[ x \geq 0 \]

6. Minimize:
   \[ z = x - 2y \]
   Subject to:
   \[ 3x + 4y \geq 12 \]
   \[ x + 2y \leq 10 \]
   \[ 0 \leq x \leq 4 \]
7. Minimize:
   \[ z = 4x + 7y \]
   Subject to:
   \[ x - y \geq 1 \]
   \[ 3x + 2y \geq 18 \]
   \[ x \geq 0 \]
   \[ y \geq 0 \]

8. Maximize:
   \[ z = 5x + 2y \]
   Subject to:
   \[ 4x - y \leq 16 \]
   \[ 2x + y \geq 11 \]
   \[ x \geq 3 \]
   \[ y \leq 8 \]
Worksheet: Piecewise Functions

Evaluate the function for the given value of x.

\[
f(x) = \begin{cases} 
3, & \text{if } x \leq 0 \\
2, & \text{if } x > 0 
\end{cases} \\
g(x) = \begin{cases} 
x + 5, & \text{if } x \leq 3 \\
2x - 1, & \text{if } x > 3 
\end{cases} \\
h(x) = \begin{cases} 
\frac{3x - 4}{2}, & \text{if } x \leq -2 \\
3 - 2x, & \text{if } x > -2 
\end{cases}
\]

1. \(f(2)\)  
2. \(f(-4)\)  
3. \(f(0)\)  
4. \(f\left(\frac{1}{2}\right)\)  
5. \(g(7)\)  
6. \(g(0)\)  
7. \(g(-1)\)  
8. \(g(3)\)  
9. \(h(-4)\)  
10. \(h(-2)\)  
11. \(h(-1)\)  
12. \(h(6)\)

Match the piecewise function with its graph.

13. \(f(x) = \begin{cases} 
x - 4, & \text{if } x \leq 1 \\
3x, & \text{if } x > 1 
\end{cases}\)  
14. \(f(x) = \begin{cases} 
x + 4, & \text{if } x \leq 0 \\
2x + 4, & \text{if } x > 0 
\end{cases}\)  
15. \(f(x) = \begin{cases} 
3x - 2, & \text{if } x \leq 1 \\
x + 2, & \text{if } x > 1 
\end{cases}\)  
16. \(f(x) = \begin{cases} 
2x + 3, & \text{if } x \geq 0 \\
x + 4, & \text{if } x < 0 
\end{cases}\)  
17. \(f(x) = \begin{cases} 
3x - 1, & \text{if } x \geq -1 \\
-5, & \text{if } x < -1 
\end{cases}\)  
18. \(f(x) = \begin{cases} 
3x - 1, & \text{if } x \leq 1 \\
-3x - 1, & \text{if } x > 1 
\end{cases}\)

A.  
B.  
C.  
D.  
E.  
F.  

Graph the function.

19. \(f(x) = \begin{cases} 
x + 3, & \text{if } x \leq 0 \\
2x, & \text{if } x > 0 
\end{cases}\)

20. \(f(x) = \begin{cases} 
x + 1, & \text{if } x < 0 \\
-x + 1, & \text{if } 0 \leq x \leq 2 \\
x - 1, & \text{if } x > 2 
\end{cases}\)

21. \(f(x) = \begin{cases} 
2, & \text{if } x \leq -3 \\
-1, & \text{if } -3 < x < 3 \\
3, & \text{if } x \geq 3 
\end{cases}\)

22. The admission rates at an amusement park are as follows.
   - Children 5 years old and under: free
   - Children between 5 years and 12 years, inclusive: $10.00
   - Children between 12 years and 18 years, inclusive: $25.00
   - Adults: $35.00

   a) Write a piecewise function that gives the admission price for a given age.
   b) Graph the function.
Graphing Piecewise Functions

Graph the following functions on the given domains.

1. \( f(x) = \begin{cases} 
2x - 1 & -2 \leq x < 1 \\
3 - x & 1 \leq x \leq 4 
\end{cases} \)

2. \( f(x) = \begin{cases} 
x + 2 & -1 \leq x < 1 \\
3x & 1 \leq x \leq 3 
\end{cases} \)

3. \( f(x) = \begin{cases} 
3x - 4 & 2 \leq x \leq 6 \\
3x - 6 & 6 < x \leq 10 
\end{cases} \)

4. \( f(x) = \begin{cases} 
2x & 1 \leq x \\
4 & x < 1 
\end{cases} \)

5. \( f(x) = \begin{cases} 
x & x < -1 \\
1 & -1 \leq x \leq 2 \\
1 - x & x > 2 
\end{cases} \)
Graph the following functions on the grid.

1. \( f(x) = \begin{cases} 
2x - 1 & -2 \leq x < 1 \\
3 - x & 1 \leq x \leq 4 
\end{cases} \)
3. \( f(x) = \begin{cases} 3x - 4 & \text{if } 2 \leq x \leq 6 \\ 3x - 6 & \text{if } 6 < x \leq 10 \end{cases} \)
4. \( f(x) = \begin{cases} \frac{2x}{4} & \text{if } x < 1 \\ x \geq 1 & \text{if } \end{cases} \)
Use the system of inequalities $y \geq 0, x \geq 0$, and $y \geq -x + 4$.

\[
f(x,y) = 3x + 2y
\]

<table>
<thead>
<tr>
<th>$x \geq 0$</th>
<th>$y \geq 0$</th>
<th>$y \geq -x + 4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0,0)</td>
<td>$3(0)+2(0)=0$</td>
<td>$\min$</td>
</tr>
<tr>
<td>(0,4)</td>
<td>$3(0)+2(4)=8$</td>
<td></td>
</tr>
<tr>
<td>(4,0)</td>
<td>$3(4)+2(0)=12$</td>
<td>$\max$</td>
</tr>
</tbody>
</table>
One Solution

\[ y = \frac{1}{2}x + 5 \]
\[ y = 3x - 1 \]

- Different slopes

No solution

\[ y = 3x + 1 \]
\[ y = 3x - 1 \]

- Same slope
- Different y-intercepts

Infinitely Many

\[ y = 3x + 1 \]
\[ 3x - y = -1 \]

- Same slopes
- Same y-intercept
Sketch the solution to each system of inequalities.

1) \( y < \frac{2}{3}x + 1 \)
   \[ y \leq -\frac{1}{3}x - 2 \]

2) \( y < -\frac{1}{2}x + 2 \)
   \[ y > \frac{3}{2}x - 2 \]

3) \( x - 2y < -4 \)
   \[ 3x - y \leq 3 \]

4) \( 4x - y \leq 2 \)
   \[ 4x - y > -1 \]
Solve each system by graphing.

5) \(5x - 2y = -2\)
   \(x - 2y = 6\)

6) \(x + y = 3\)
   \(x - 2y = 6\)

7) \(y = -x + 3\)
   \(y = -8x - 4\)

8) \(y = -\frac{2}{3}x + 3\)
   \(y = \frac{4}{3}x - 3\)
Solve each system by elimination.

9) \[14x - 6y = 4\]
   \[7x - 10y = -26\]

10) \[18x + 9y = -27\]
    \[-9x - 3y = 12\]

11) \[7x + 7y = -7\]
    \[-2x + 5y = 23\]

12) \[-6x + 7y = -13\]
    \[-10x + 10y = -10\]

Solve each system by substitution.

13) \[-6x - 6y = 24\]
    \[y = -3x - 6\]

14) \[y = x\]
    \[5x - 7y = 2\]
Answers to Mini Test Review

1) 

2) 

3) 

4) 

5) \((-2, -4)\)  
6) \((4, -1)\) 

7) \((-1, 4)\)  
8) \((3, 1)\)  
9) \((2, 4)\)  
10) \((-1, -1)\) 

11) \((-4, 3)\)  
12) \((-6, -7)\)  
13) \((-1, -3)\)  
14) \((-1, -1)\)