Name ______________________ Class ______________ Date ______________

Practice 2-1

Relations and Functions

For each function, find $f(-2)$, $f\left(-\frac{1}{2}\right)$, $f(3)$, and $f(7)$.

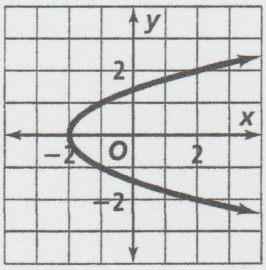
1. $f(x) = 5x + 2$

2. $f(x) = -\frac{1}{3}x + 1$

3. $f(x) = -3x + 1.8$

Use the vertical line test to determine whether each graph represents a function.

4.



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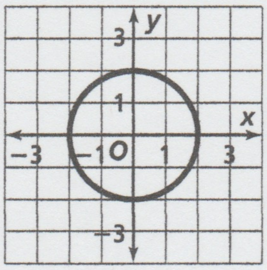

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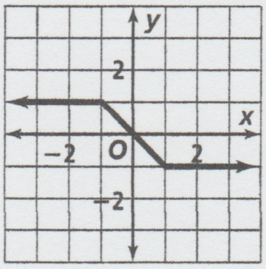


Graph each relation. Find the domain and range.

7. $\left\{(1, -2), \left(2, \frac{3}{4}\right), \left(3, 3\frac{1}{2}\right), (5, 9)\right\}$

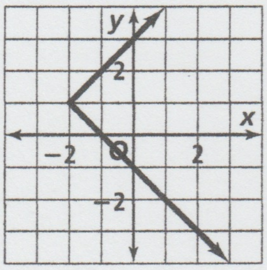
8. $\{(-3, 5), (0, -2), (0, 4), (1, -2)\}$

9. $\{(-1, 2), (2, 2), (3, 2)\}$

10. $\{(0.5, -1), (0.5, 0). (0.5, 1), (0.5, 3)\}$

Determine whether each graph represents y as a function of x.

11.



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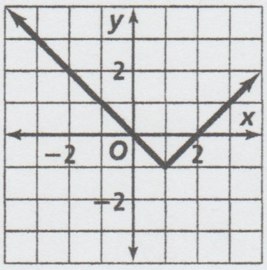

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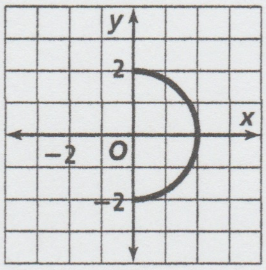

Make a mapping diagram for each relation, and determine whether it is a function.

14. $\{(1, 2), (2, 3), (2, 4), (3, 5)\}$

15. $\{(-1, 1), (0, 0), (1, 1), (2, 4), (3, 9)\}$

Suppose $f(x) = -3x + 2$ and $g(x) = \frac{1}{2}x - 1$. Find each value.

16. $f\left(\frac{1}{3}\right)$

17. $3g(4)$

18. $\dfrac{g(-2)}{f(3)}$

19. $\dfrac{f(-1)}{g(5)}$

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Reteaching 2-2

Linear Equations

OBJECTIVE: Using the slope-intercept form to write equations of lines

MATERIALS: None

- The slope-intercept formula is $y = mx + b$, where m represents the slope of the line, and b represents its y-intercept. The y-intercept is the point at which the line crosses the y-axis.
- The slope of a horizontal line is always zero, and the slope of a vertical line is always undefined.

Example

Find the equation of the line that contains the point (3, −1) and has a slope of $-\frac{4}{3}$.

$-1 = \left(-\frac{4}{3}\right)(3) + b$ ⟵ **To find b, substitute the values $-\frac{4}{3}$ for m, 3 for x, and −1 for y into the slope-intercept formula.**

$-1 = -4 + b$

$3 = b$

$y = -\frac{4}{3}x + 3$ ⟵ **Substitute $-\frac{4}{3}$ for m and 3 for b into the slope-intercept formula.**

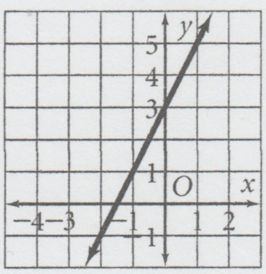
Exercises

Write the equation of each line.

1. $m = 4$; contains (3, 2)
2. $m = -2$; contains (4, 7)
3. $m = 0$; contains (3, 0)
4. $m = -1$; contains (−5, −2)
5. $m = 3$; contains (−2, −4)
6. $m = 0$; contains (0, −7)
7. $m = 8$; contains (5, 0)
8. $m = -1$; contains (0, 7)
9. $m = 0$; contains (3, 8)
10. $m = 4$; contains (2, 5)
11. $m = 7$; contains (3, 2)
12. $m = -1$; contains (2, −6)

Write the equation of each line.

13.



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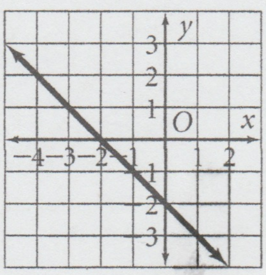

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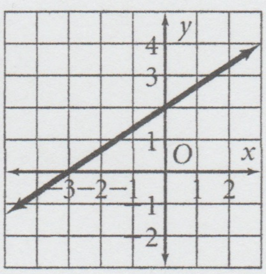

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Practice 2-2

Linear Equations

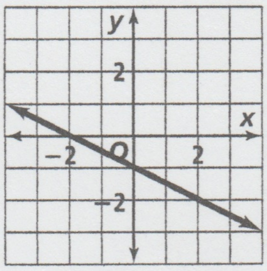
Find the slope of each line.

1. $2x - 5y = 0$

2. $5x - y = -7$

3. $x - \frac{2}{3}y = \frac{1}{4}$

4.



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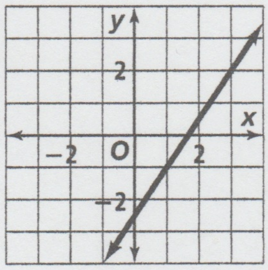

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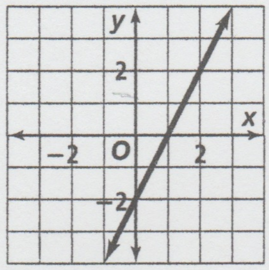

7. through $(4, -1)$ and $(-2, -3)$

8. through $(3, -5)$ and $(1, 2)$

Write in point-slope form the equation of the line through each pair of points.

9. $(0, 1)$ and $(3, 0)$

10. $\left(\frac{1}{2}, \frac{2}{3}\right)$ and $\left(-\frac{3}{2}, \frac{5}{3}\right)$

11. $(-3, -2)$ and $(1, 6)$

Graph each equation.

12. $4x + 3y = 12$

13. $\frac{x}{3} - \frac{y}{6} = 1$

14. $y = -\frac{3}{2}x + \frac{1}{2}$

Write in standard form an equation of the line with the given slope through the given point.

15. slope $= -4$; $(2, 2)$

16. slope $= \frac{2}{5}$; $(-1, 3)$

17. slope $= 0$; $(3, -4)$

Find the slope and the intercepts of each line.

18. $3x - 4y = 12$

19. $y = -2$

20. $f(x) = \frac{4}{5}x + 7$

21. $x = 5$

Write an equation for each line. Then graph the line.

22. through $(-1, 3)$ and parallel to $y = 2x + 1$

23. through $(2, 2)$ and perpendicular to $y = -\frac{3}{5}x + 2$

24. through $(-3, 4)$ and vertical

25. through $(4, 1)$ and horizontal

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Reteaching 2-3

Direct Variation

OBJECTIVE: Writing and interpreting direct variation equations	**MATERIALS:** None

A linear function defined by an equation of the form $y = kx$, where $k \neq 0$, represents *direct variation.* The constant k, the slope of the line, is called the *constant of variation.*

Given the value of y corresponding to a specific value of x, you can find the constant of variation k by substituting the given values of x and y into the equation $k = \frac{y}{x}$.

The equation $y = kx$ can be used to find the values of y that correspond to other values of x or vice versa.

Examples

Find the missing value for each direct variation.

a. If $y = 5$ when $x = 2$, find y when $x = 7$.

$k = \frac{y}{x} = \frac{5}{2}$ ⟵ **Use $y = 5, x = 2$, and $k = \frac{y}{x}$ to find the value of k.**

$y = \frac{5}{2}x$ ⟵ **Now use the form $y = kx$ and $k = \frac{5}{2}$ to write the equation of the direct variation.**

$y = \frac{5}{2}x = \frac{5}{2}(7) = \frac{35}{2} = 17\frac{1}{2}$ ⟵ **To find the value of y when $x = 7$, replace x with 7 in the direct variation equation and simplify to find y.**

b. If $y = 6$ when $x = -3$, find x when $y = -4$.

$k = \frac{y}{x} = \frac{6}{-3} = -2$ ⟵ **Use $y = 6, x = -3$, and $k = \frac{y}{x}$ to find the value of k.**

$y = -2x$ ⟵ **Now use the form $y = kx$ and $k = -2$ to write the equation of the direct variation.**

$-4 = -2x$
$2 = x$ ⟵ **To find the value of x when $y = -4$, replace y with -4 in the direct variation equation and solve for x.**

Exercises

Find the missing value for each direct variation.

1. If $y = 8$ when $x = 4$, find y when $x = 6$.

2. If $y = 12$ when $x = 3$, find y when $x = 5$.

3. If $y = 9$ when $x = 3$, find x when $y = 7$.

4. If $y = -6$ when $x = 2$, find x when $y = 9$.

5. If $y = \frac{3}{2}$ when $x = \frac{1}{4}$, find y when $x = \frac{2}{3}$.

6. If $y = 7$ when $x = 2$, find x when $y = 3$.

7. The height of an object varies directly with the length of its shadow. A person 6 ft tall casts an $8\frac{1}{2}$ ft shadow, while a tree casts a 38 ft shadow. How tall is the tree?

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Practice 2-3

Direct Variation

For each direct variation, find the constant of variation. Then find the value of *y* when *x* = 3.

1. $y = 3$ when $x = -2$ **2.** $y = \frac{3}{4}$ when $x = \frac{1}{8}$ **3.** $y = -\frac{3}{8}$ when $x = -\frac{2}{3}$

Determine whether *y* varies directly with *x*. If so, find the constant of variation.

4. $y = \frac{4}{9}x$ **5.** $y = -1.2x$ **6.** $y + 4x = 0$ **7.** $y - 3x = 1$

8. $y = 3x$ **9.** $y + 2 = x$ **10.** $y - \frac{3}{5}x = 0$ **11.** $y = -3.5x + 7$

For each function, determine whether *y* varies directly with *x*. If so, find the constant of variation and write the equation.

12.

x	y
1	1
2	4
3	9

13.

x	y
−1	−3
1	3
3	9

14.

x	y
−2	−1
2	1
5	$\frac{5}{2}$

15.

x	y
−2	−3
0	1
1	3

Write an equation for a direct variation with a graph that passes through each point.

16. $(6, 2)$ **17.** $(-1.5, 9)$ **18.** $(-5, 90)$ **19.** $(7, 3)$

20. $\left(-1, -\frac{2}{3}\right)$ **21.** $\left(\frac{3}{5}, -\frac{7}{2}\right)$ **22.** $(10, 25)$ **23.** $(3, 165)$

In Exercises 24–27, *y* varies directly with *x*.

24. If $y = 3$ when $x = 2$, find x when $y = 5$.

25. If $y = -4$ when $x = \frac{1}{2}$, find y when $x = \frac{2}{3}$.

26. If $y = -14$ when $x = -7$, find x when $y = 22$.

27. If $y = \frac{5}{17}$ when $x = 10$, find y when $x = 5$.

28. A 15-minute long-distance telephone call costs $.90. The cost varies directly with the length of the call. Write an equation that relates the cost to the length of the call. How long is a call that costs $1.32?

29. The distance a spring stretches varies directly with the amount of weight that is hanging on it. A weight of 2.5 pounds stretches a spring 18 inches. Find the stretch of the spring when a weight of 6.4 pounds is hanging on it.

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Reteaching 2-5

Absolute Value Functions and Graphs

OBJECTIVE: Graphing absolute value functions **MATERIALS:** Graph paper, ruler

A function of the form $f(x) = |mx + b|$ is an *absolute value function.*

The graph of $f(x) = |mx + b|$ looks like an angle; its vertex is located at the point $\left(-\frac{b}{m}, 0\right)$.

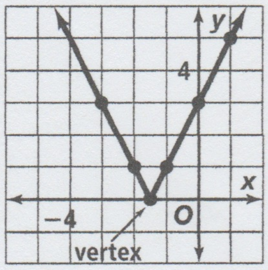
Example

Graph $f(x) = |2x + 3|$.

First find the vertex. Using the form $\left(-\frac{b}{m}, 0\right)$ where $b = 3$ and $m = 2$, we obtain the vertex $\left(-\frac{3}{2}, 0\right)$.

Now find several points on the graph of $f(x) = |2x + 3|$. Choose values of x on both sides of the vertex.

x	−3	−2	−1	0	1
y	3	1	1	3	5



Plot the vertex and the points from the table in a rectangular coordinate system. Finish the graph by drawing two rays emanating from the vertex and passing through the other points.

Exercises

Find the vertex of each absolute value function.

1. $f(x) = |5x|$

2. $f(x) = |x + 3|$

3. $f(x) = |x - 4|$

4. $f(x) = |3x + 1|$

5. $f(x) = \left|\frac{1}{2}x - 3\right|$

6. $f(x) = \left|\frac{1}{4}x + 2\right|$

Find the vertex of each absolute value function. Then graph the function by plotting several other points.

7. $f(x) = |2x - 1|$

8. $f(x) = |3x - 1|$

9. $f(x) = |2x + 4|$

10. $f(x) = |x + 1|$

11. $f(x) = |x - 2|$

12. $f(x) = \left|2x - \frac{3}{2}\right|$

13. $f(x) = |3x|$

14. $f(x) = \left|\frac{1}{2}x + 1\right|$

15. $f(x) = \left|\frac{2}{3}x + 2\right|$

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Practice 2-5

Absolute Value Functions and Graphs

Match each equation with its graph.

1. $y = |x - 1|$

2. $y = 2|x - 1|$

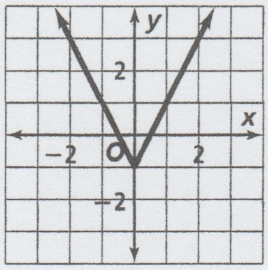
3. $y = |2x| - 1$

4. $y = |x| - 1$

5. $y = |2x - 1|$

6. $y = |2x| - 2$

A.



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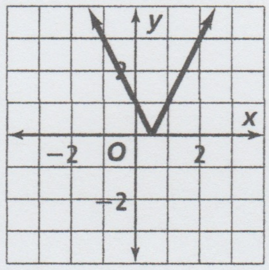

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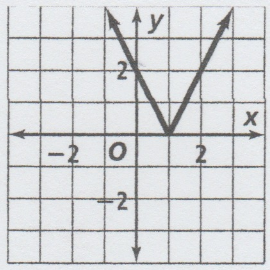

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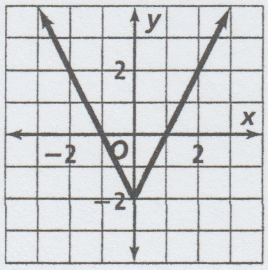

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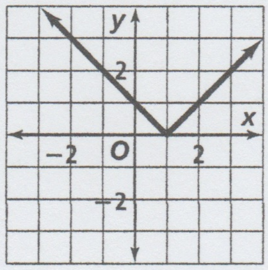

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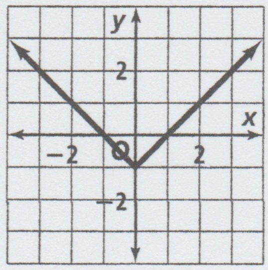


Graph each equation by writing two linear equations.

7. $y = |x - 3|$

8. $y = |2x - 5|$

9. $y = 2|x + 2|$

10. $y = |x + 3| - 1$

11. $y = -|3x + 4|$

12. $y = \left|\frac{1}{2}x - 2\right| + 1$

Graph each absolute value equation.

13. $y = |3 - x|$

14. $y = -\frac{2}{3}\left|\frac{1}{3}x\right|$

15. $y = 3 - |x + 1|$

16. $y = -|-x - 2|$

17. $3y = |2x - 9|$

18. $y = -|x| + 2$

19. $\frac{1}{2}y = |3x - 1| - 2$

20. $y + 3 = |x + 1|$

21. $-2y = |2x - 4|$

Reteaching 2-6

Vertical and Horizontal Translations

OBJECTIVE: Analyzing vertical, horizontal, and diagonal translations of the absolute value function

MATERIALS: Graph paper

If h and k are positive numbers, then

$g(x) = |x| + k$ shifts the graph of $f(x) = |x|$ up k units;

$g(x) = |x| - k$ shifts the graph of $f(x) = |x|$ down k units;

$g(x) = |x + h|$ shifts the graph of $f(x) = |x|$ left h units;

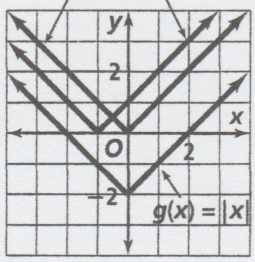
$g(x) = |x - h|$ shifts the graph of $f(x) = |x|$ right h units.

Examples

Graph each translation of $f(x) = |x|$.

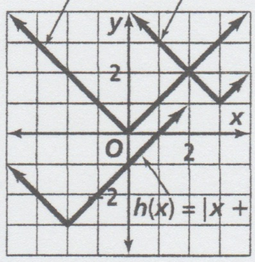
1. a. $g(x) = |x| - 2$ ⟵ **Shift the graph of $f(x) = |x|$ down 2 units.**

b. $h(x) = |x + 1|$ ⟵ **Shift the graph of $f(x) = |x|$ left 1 unit.**



2. a. $g(x) = |x - 3| + 1$ ⟵ **Shift the graph of $f(x) = |x|$ right 3 units and up 1 unit.**

b. $h(x) = |x + 2| - 3$ ⟵ **Shift the graph of $f(x) = |x|$ left 2 units and down 3 units.**



Exercises

Complete each sentence. Then graph the translation of $f(x) = |x|$.

1. $g(x) = |x - 2|$ ⟵ Shift the graph of $f(x) = |x|$ ______ 2 units.
2. $g(x) = |x| + 1$ ⟵ Shift the graph of $f(x) = |x|$ ______ 1 unit.
3. $g(x) = |x| - 3$ ⟵ Shift the graph of $f(x) = |x|$ ______ 3 units.
4. $g(x) = |x + 3|$ ⟵ Shift the graph of $f(x) = |x|$ ______ 3 units.
5. $g(x) = |x - 1| - 5$ ⟵ Shift the graph of $f(x) = |x|$ ______ 1 unit and ______ 5 units.
6. $g(x) = |x + 4| + 2$ ⟵ Shift the graph of $f(x) = |x|$ ______ 4 units and ______ 2 units.

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Practice 2-6

Vertical and Horizontal Translations

Describe each translation of $f(x) = |x|$ as vertical, horizontal, or diagonal. Then graph each translation.

1. $f(x) = |x + 2|$

2. $f(x) = |x + 4|$

3. $f(x) = |x| - 5$

4. $f(x) = |x + 1| - 1$

5. $f(x) = |x - 2| + 1$

6. $f(x) = \left|x - \frac{3}{2}\right|$

7. $f(x) = |x| - \frac{1}{3}$

8. $f(x) = \left|x - \frac{5}{2}\right|$

9. $f(x) = \left|x + \frac{1}{2}\right| + \frac{3}{2}$

Write an equation for each translation.

10. $y = |x|$, 1 unit up, 2 units left

11. $y = |x|$, 4 units right

12. $y = -|x|$, 3 units up, 1 unit right

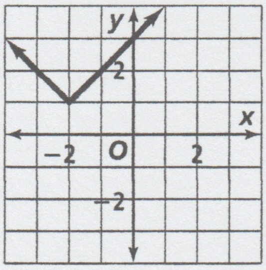
13. $y = -|x|$, $\frac{3}{2}$ units down, $\frac{1}{2}$ unit right

14. $y = |x|$, 2 units down, 3 units left

15. $y = -|x|$, $\frac{3}{5}$ unit up

Write the equation of each translation of $y = x$ or $y = |x|$.

16.



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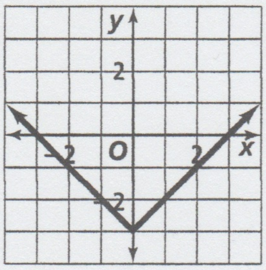

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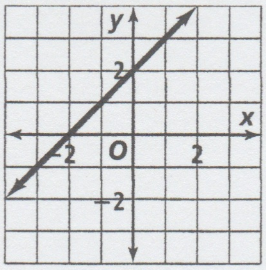
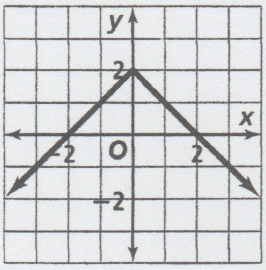


Each graph shows a translation of $y = -|x|$. State the values of h and k.

19.



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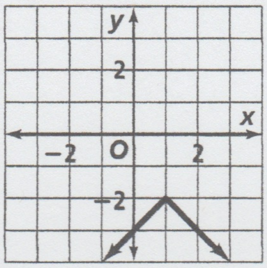

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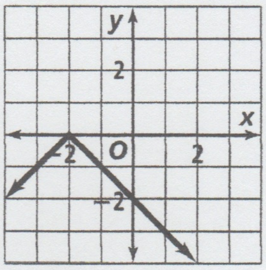

Graph each equation.

22. $y = |x - 1| + 2$

23. $y = -\left|x + \frac{1}{2}\right|$

24. $y = -|x + 3| - 1$

25. $y = |-x - 1|$

26. $y = -|x - 2| + 4$

27. $y = |x + 2| - 1$

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Reteaching 2-7

Two-Variable Inequalities

OBJECTIVE: Graphing inequalities with two variables

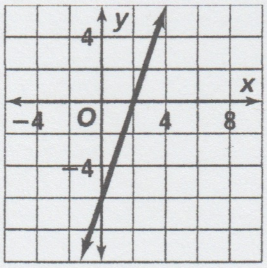
MATERIALS: Highlighting marker

Example

Graph the inequality $6x - 2y \le 12$.

$6x - 2y \le 12$

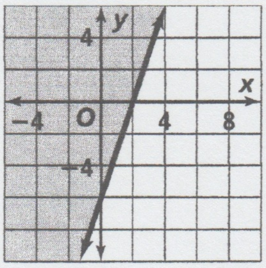
$y \ge 3x - 6$ ← **To graph the boundary line, write the inequality in slope-intercept form as if it were an equation.**



← **The boundary line is solid if the inequality contains ≤ or ≥. The boundary line is dashed if the inequality contains < or >. Graph the boundary line $y = 3x - 6$ as a solid line.**

$0 \ge 3(0) - 6$ ← **Since the boundary line does not contain the origin, substitute the point (0, 0) into the inequality.**

$0 \ge -6$ ← **Simplify. The resulting inequality is true.**



← **Use your highlighting marker to shade the region that contains the origin. If the resulting inequality were false, then you would shade the region that does not contain the origin.**

Exercises

Graph each inequality.

1. $y > 2x$

2. $x + y < 4$

3. $y < x + 1$

4. $y > x - 2$

5. $3x + 4y \le 12$

6. $2y - 3x > 6$

7. $3x - 2 \le 5x + y$

8. $x < -4$

9. $y \ge 5$

10. $x + 2y \ge 4$

11. $x + y < x + 2$

12. $3x - 3y < 3$

13. $x - 1 \ge 0$

14. $2y \le 3$

15. $3x > 2 + y$

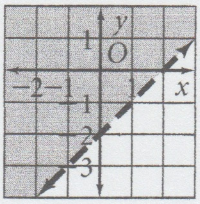
Name ______________________________ Class ____________________ Date ________________

Practice 2-7

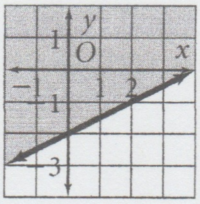
Two-Variable Inequalities

Write an inequality for each graph. In each case, the equation for the boundary line is given.

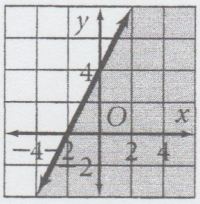
1. $y = x - 2$



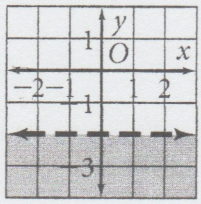
2. $x - 2y = 4$



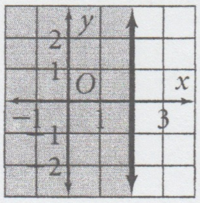
3. $y - 2x = 4$



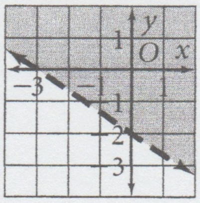
4. $y = -2$



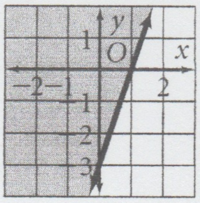
5. $x = 2$



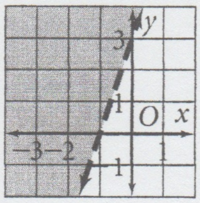
6. $-2x - 3y = 6$



7. $3x - y = 3$



8. $y - 3x = 3$



Graph each inequality on a coordinate plane.

9. $y < x$ **10.** $y \geq x$ **11.** $y > 2$ **12.** $y < 2$

13. $x \leq 2$ **14.** $x > 2$ **15.** $y \geq |x|$ **16.** $y > -2x + 1$

17. $y \geq 3x - 4$ **18.** $4x + 2y \leq 8$ **19.** $4x - 2y \leq 4$ **20.** $4y - 2x \geq 4$

21. $y > |x + 2|$ **22.** $y \leq |x - 2|$ **23.** $y > |x| + 2$ **24.** $y < |x| - 2$

25. $y \leq |4x| + 1$ **26.** $y \geq \left|\frac{1}{6}x\right| - 3$ **27.** $y > -\frac{1}{6}x - 1$ **28.** $3x \leq 5y$

29. You need to make at least 150 sandwiches for a picnic. You are making tuna sandwiches and ham sandwiches.

a. Write an inequality for the number of sandwiches you can make.

b. Graph the inequality.

c. Does the point (90, 80) satisfy the inequality? Explain.

30. A salesperson sells two models of vacuum cleaners. One brand sells for \$150 each, and the other sells for \$200 each. The salesperson has a weekly sales goal of at least \$1800.

a. Write an inequality relating the revenue from the vacuum cleaners to the sales goal.

b. Graph the inequality.

c. If the salesperson sold exactly six \$200 models last week, how many \$150 models did she have to sell to make her sales goal?