

Math Connections Worksheets

MAT1033C Intermediate Algebra

Chapter 3

Graphs and Functions

Name:
Instructor:

Date:
Section:

Chapter 3 Graphs and Functions
Section 3.1 Graphing Equations

Learning Objectives

1. Plot ordered pairs.
2. Determine whether an ordered pair is a solution to an equation in two variables.
3. Graph linear equations.
4. Graph nonlinear equations.

Objective 1

In words, describe where the given point will be graphed. State the quadrant in which it will be.

1. $(-10, 16)$

1. _____

2. $(5, -9)$

2. _____

3. $(7, 19)$

3. _____

4. $(-15, -18)$

4. _____

Objective 2

Determine whether each ordered pair is a solution of the given equation.

5. $2x + 3y = 7$; $(2, -1)$

5. _____



6. $-6x + 5y = -6$; $(1, 0)$, $\left(2, \frac{6}{5}\right)$

6. _____

Name:

Date:

Instructor:

Section:

7. $y = 2x^3 - 4x^2 + 3x - 6$; $(-1, -15)$

7. _____

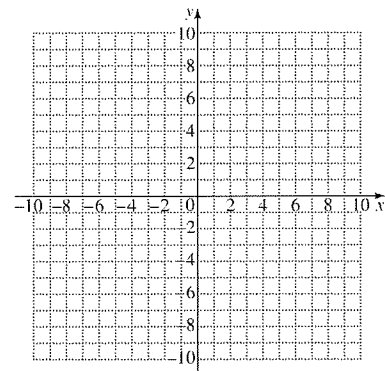
8. $y = |x + 2|$; $(-6, -4)$

8. _____

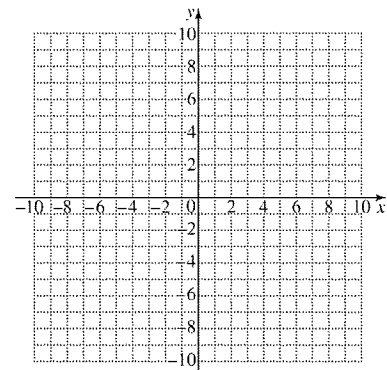
Objective 3

Graph the following equations by finding and plotting ordered pair solutions.

9. $2x - 3y = 6$



10. $y = \frac{3}{4}x - 8$



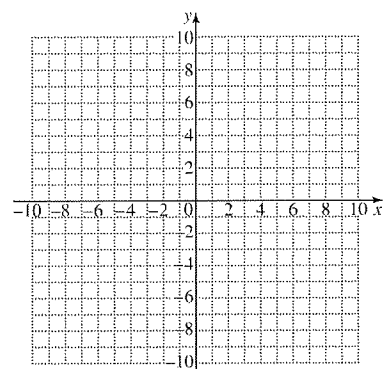
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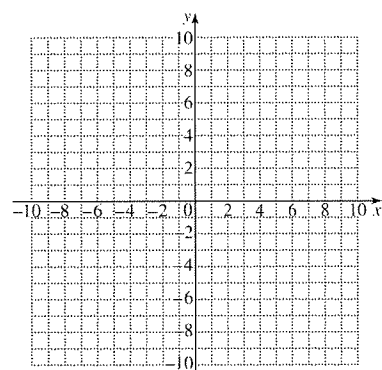
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Section:

11. $x = 2y - 6$



12. $y = -3x$



Name:

Date:

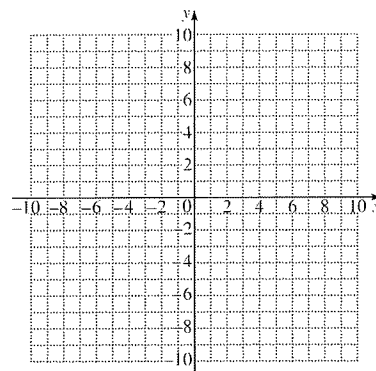
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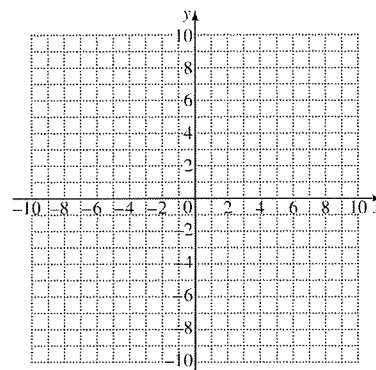
Objective 4

Graph the following equation by finding points and plotting ordered pair solutions.

13. $y = 2|x|$



14. $y = x^2 - 4$



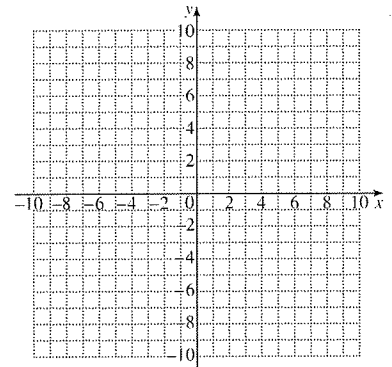
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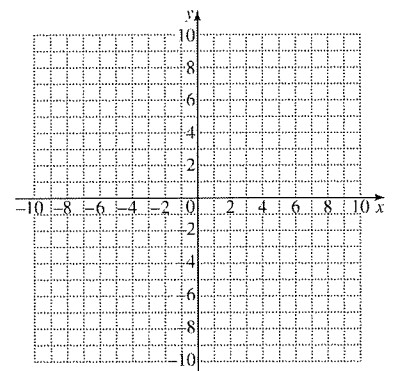
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Section:

15. $y = x^3 - 7$



16. $y = |x + 3|$



Name:

Date:

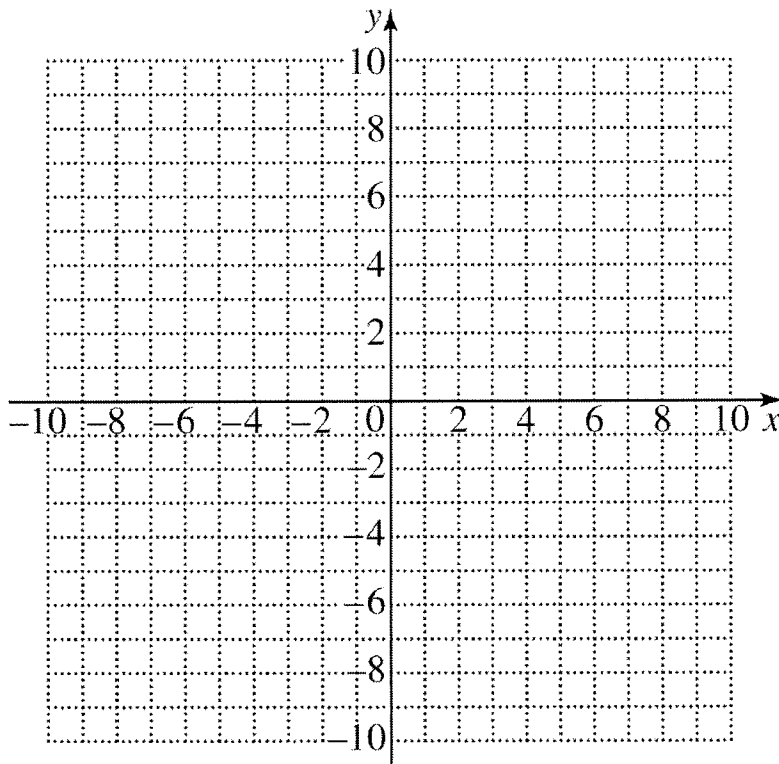
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Section:

Concept Extension

17. Graph $y = x^2$ and $y = (x-2)^2 + 5$ on the same rectangular coordinate system. Explain what the difference happens to be between the two graphs.

17. _____



Name:
Instructor:

Date:
Section:

Section 3.2 Introduction to Functions

Learning Objectives

1. Define relation, domain, and range.
2. Identify functions.
3. Use the vertical line test for functions.
4. Find the domain and range of a function.
5. Use function notation.

Vocabulary

Use the choices to complete each statement.

Domain

Function

Horizontal

Range

Relation

Vertical

x

y

1. A _____ is a set of ordered pairs that for every x value there is only one y value.
2. The _____ of the function is the x- values.
3. To find the x-intercept, you would let _____ = 0.
4. To determine if a graph is a function, it must pass the _____ line test.
5. A set of ordered pairs is called a _____.
6. The _____ of a function is the y-values.
7. To find the y-intercept, you would let _____ = 0

Objective 1

Find the domain and range of the function.

8. $\{(-2, 4), (8, -9), (-4, 6), (-2, 8)\}$

8. _____

9. $\{(1, 7), (-7, 3), (0, -6), (12, 15)\}$

9. _____

10. $\{(-12, 16), (33, 45), (-72, 99), (110, -114)\}$

10. _____

Name:

Date:

Instructor:

Section:

Objective 2

Decide whether each is a function.



11. $y = x + 1$

11. _____

12. $\{(12, 7), (-17, 3), (1, -6), (12, -5)\}$

12. _____

13. $y = x^2 - 9$

13. _____

14. $x = y^4 + 5$

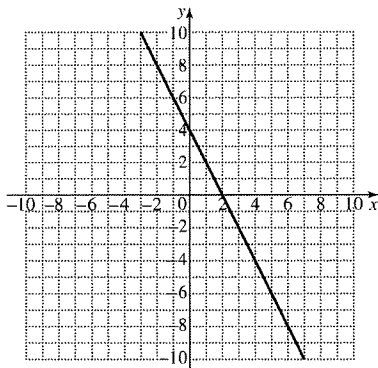
14. _____

Objective 3

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

15.

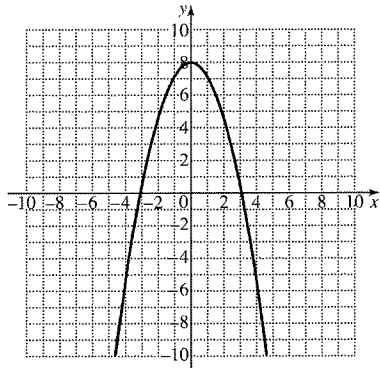
15. _____



Name:
Instructor:

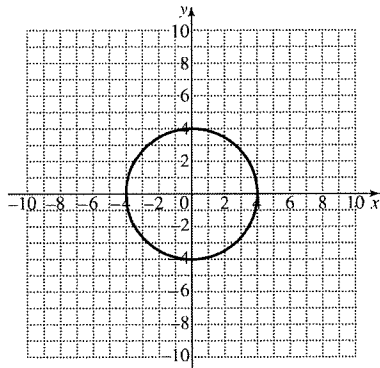
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Section:

16.



16. _____

17.

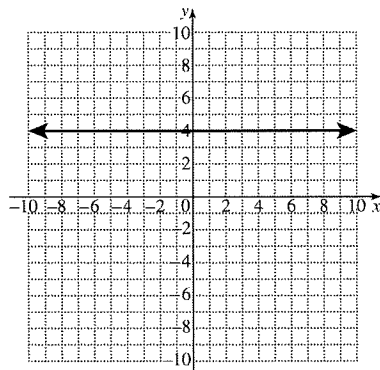


17. _____

Objective 4

Find the domain and range of each relation.

18.

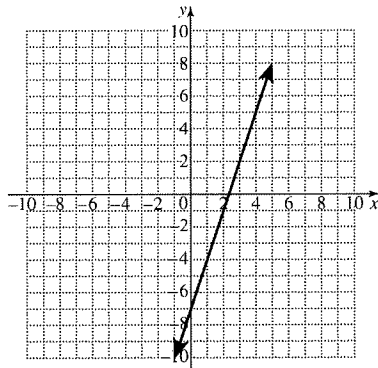


18. _____

Name:
Instructor:

Date:
Section:

19.



19. _____

Objective 5

If $f(x) = 3x + 3$ and $g(x) = 4x^2 - 6x + 3$, and $h(x) = 5x^2 - 7$, find the following.



20. $h(-3)$

20. _____

21. $f(7)$

21. _____

22. $g(-5)$

22. _____

Name:

Date:

Instructor:

Section:

Concept Extension.

Given the function $f(x) = 3x - 4$.

23. Find $f(a)$ and $f(a-h)$.

23. _____

24. Using the function in number 23, find $\frac{f(a) - f(a-h)}{h}$.

24. _____

Name:

Date:

Instructor:

Section:

Section 3.3 Graphing Linear Functions

Learning Objectives

1. Graph linear function
2. Graph linear functions by finding intercepts.
3. Graph vertical and horizontal lines.

Vocabulary

Use the choices to complete each statement.

Horizontal

Linear

Vertical

b

m

x

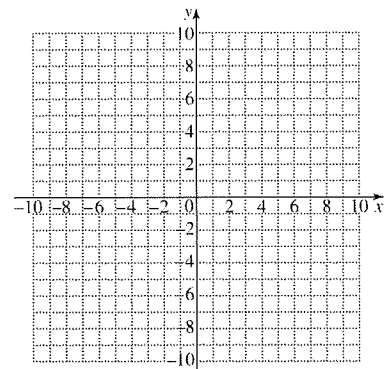
y

1. The equation $y - 8 = 4$ is a _____ line.
2. A _____ function's equation can be written in the form $f(x) = mx + b$.
3. The equation $x = -5$ is a _____ line.
4. In the equation $y = mx + b$, the _____ represents the slope, and the _____ represents the _____-intercept.

Objective 1

Graph each linear function.

5. $f(x) = -2x + 3$



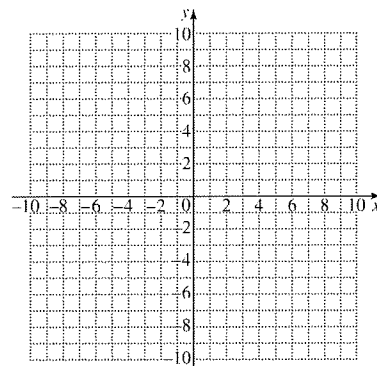
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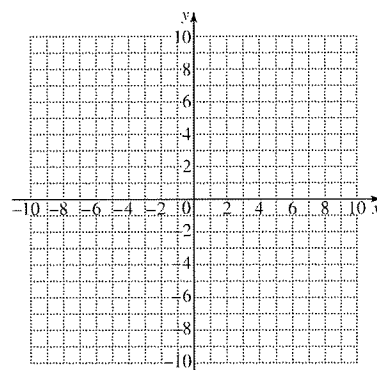
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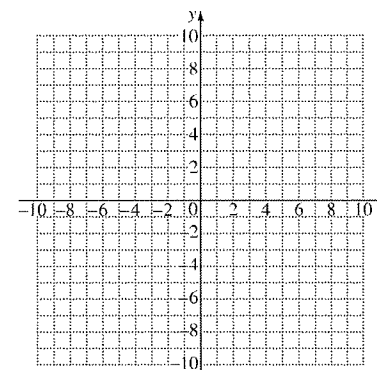
6. $f(x) = -x - 4$



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



8. $f(x) = 0.25x - 6$



Name:

Date:

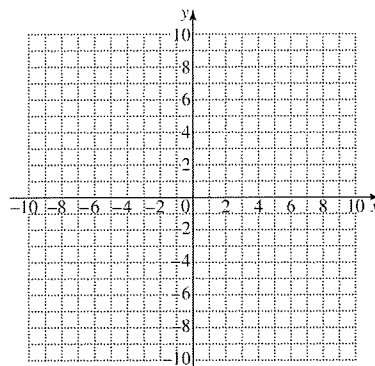
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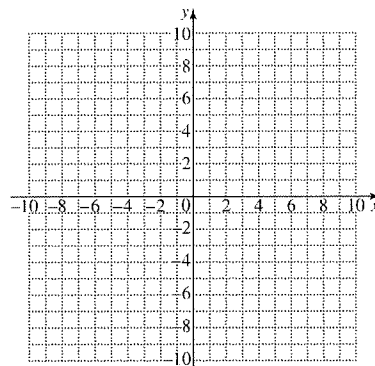
Objective 2

Graph each linear function by finding x - and y - intercepts.

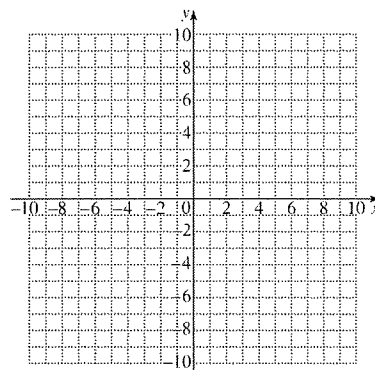
9. $3x - 2y = 12$



10. $x - y = -6$



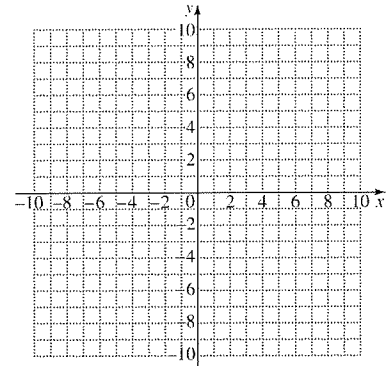
11. $2x - 3y = -9$



Name:
Instructor:

Date:
Section:

12. $-y + 3x = 9$

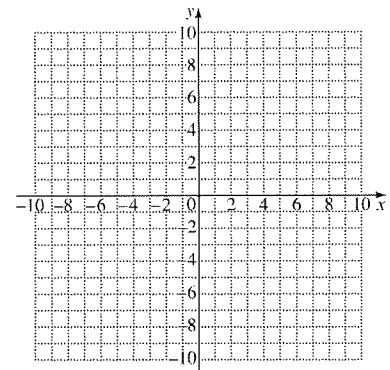


Objective 3

Graph each linear equation.



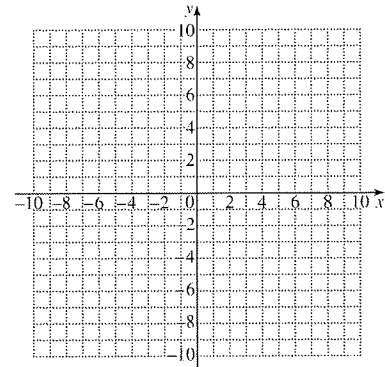
13. $x = -1$



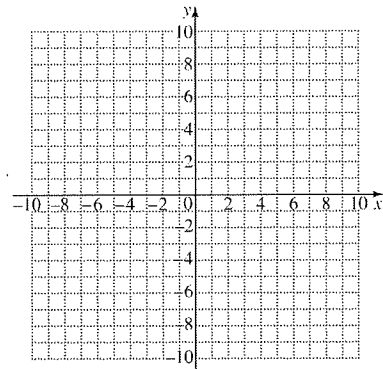
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Instructor:

Date:
Section:

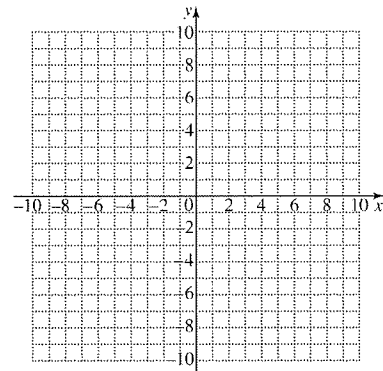
14. $y - 2 = -3$



15. $-5x = 15$



16. $-y = -6$



Name:

Date:

Instructor:

Section:

Concept Extension

17. Given the equation $f(x) = 7$, what is the coefficient in front of the x ? What is the slope of this line?

17. _____

Name:
Instructor:

Date:
Section:

Section 3.4 The Slope of a Line

Learning Objectives

1. Find the slope of a line given two points on the line.
2. Find the slope of a line given the equation of a line.
3. Interpret the slope-intercept form in an application
4. Find the slopes of horizontal and vertical lines.
5. Compare the slopes of parallel and perpendicular lines.

Vocabulary

Use the choices to complete each statement.

**Different
Slope
0**

**Equal
Slope-Intercept
1**

**Perpendicular
Undefined**

1. Two parallel lines will have _____ slopes, but _____ intercepts.
2. The slope of a vertical line is _____.
3. The rate of change in which a line increases or decreases, is the _____.
4. If the slopes of two lines are opposite reciprocals, they are said to be _____.
5. The form $y = mx + b$ is called _____ form.
6. The slope of the line $y = 1$ is _____.

Objective 1

Find the slope of the line that runs through the given points.

7. $(-2, -6), (4, -4)$

7. _____

8. $(-1, 0), (-4, -9)$

8. _____

9. $(7, -2), (7, 9)$

9. _____

Name:
Instructor:

Date:
Section:

Objective 2

Find the slope of each line.

10. $y = \frac{1}{5}x - 9$

10. _____

11. $4x - 7y = 10$

11. _____

12. $f(x) = -5x$

12. _____

Objective 3

Solve.



13. With wireless Internet (WiFi) gaining popularity, the number of public wireless Internet access points (in thousands) is projected to grow from 2003 to 2008 according to the equation $-66x + 2y = 84$ where x is the number of years after 2003.

a. Find the slope and y -intercept of the linear equation.

b. What does the slope mean in this context?

c. What does the y -intercept mean in this context?

13a. _____

13b. _____

13c. _____

Name:

Date:

Instructor:

Section:

14. The cost C , in dollars, of renting a convertible for a day is given by the equation $C(x) = 0.25x + 64$, where x is the number of miles driven.

a. Find the slope and y -intercept of the linear equation.

b. What does the slope mean in this context.

c. What does the y -intercept mean in this context.

14a. _____

14b. _____

14c. _____

Objective 4

Find the slope of each line.

15. $x = -5$

15. _____

16. $y = 13$

16. _____

17. $-3x = 12$

17. _____

18. $y + 6 = -12$

18. _____

Name:
Instructor:

Date:
Section:

Objective 5

Determine whether the lines are parallel, perpendicular, or neither.



19.

$$f(x) = -3x + 6$$

$$g(x) = 3x + 5$$

19. _____

20.

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

$$-x + 3y = 7$$

20. _____

21.

$$2x + 3y = 9$$

$$3x - 2y = 9$$

21. _____

Concept Extension

22. Find the slope of the line that is perpendicular to $4x - 7y = 14$.

22. _____

23. Find the slope of the line that is parallel to $12x - 15y = 18$.

23. _____

Name:

Date:

Instructor:

Section:

Section 3.5 Equations of Lines

Learning Objectives

1. Use the slope-intercept form to write the equation of a line.
2. Graph a line using its slope and y-intercept.
3. Use the point-slope form to write the equation of a line.
4. Write equations of vertical and horizontal lines.
5. Find equations of parallel and perpendicular lines.

Objective 1

Use the slope-intercept form of the linear equation to write the equation of each line with the given slope and y-intercept.

1. Slope = -2 ; y-intercept $(0, -4)$

1. _____

2. Slope = $\frac{2}{3}$; y-intercept $(0, 6)$

2. _____

3. Slope = $-\frac{3}{5}$; y-intercept $\left(0, -\frac{7}{9}\right)$

3. _____

Name:

Date:

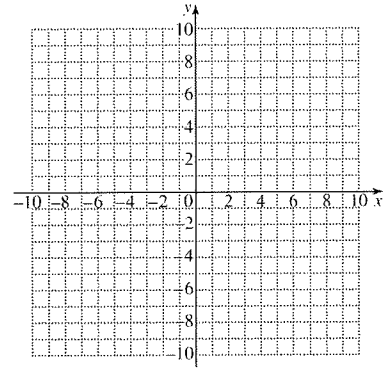
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Section:

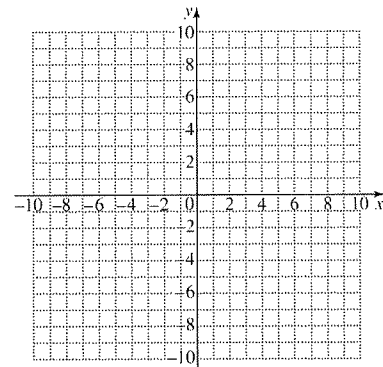
Objective 2

Graph each linear equation using slope-intercept form.

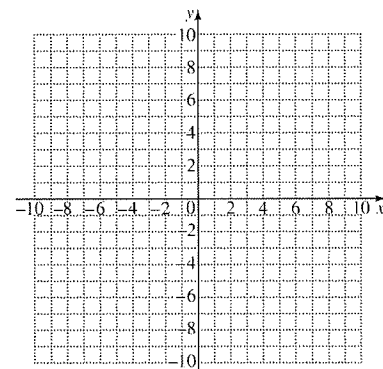
4. $y = \frac{2}{5}x - 8$



5. $4x - 3y = 8$



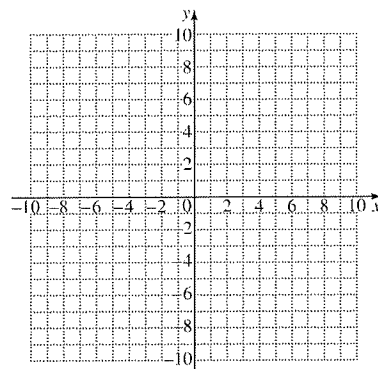
6. $-3x - 6y = 12$



Name:
Instructor:

Date:
Section:

7. $x = 3y - 9$



Objective 3

Find the equation of a line with the given slope and containing the given point. Write the equation in slope-intercept form.



8. Slope = 3; through (1, 2)

8. _____

9. Slope = $\frac{1}{4}$; through (8, -3)

9. _____

10. Slope = $-\frac{2}{5}$; through (3, -4)

10. _____

Name:
Instructor:

Date:
Section:

11. Slope = -7 ; through $(\frac{1}{2}, \frac{3}{5})$

11. _____

Objective 4

Find the equation of each line.

12. Slope = 0 ; through $(-1, -5)$

12. _____

13. Vertical line; through $(2, 6)$

13. _____

14. Undefined slope; through $(-5, -\frac{2}{3})$

14. _____

15. Horizontal line; through $(\frac{2}{5}, -\frac{1}{3})$

15. _____

Objective 5

Find the equation of each line. Write the equation using function notation.



16. Through $(2, -5)$; perpendicular to $3y = x - 6$

16. _____

Name:
Instructor:

Date:
Section:

17. Through $(1, -3)$; parallel to $x - 3y = 7$

17. _____

18. Through $(3, -5)$; parallel to $y = -3$

18. _____

19. Through $(0, -23)$; perpendicular to $2x - 3y = 8$

19. _____

Concept Extension

Find the slope of the line through the following points. Use function notation to write the equation.



20. $(-3, -8), (-6, -9)$

20. _____

21. $(\frac{3}{4}, -\frac{2}{5}), (-\frac{1}{5}, \frac{1}{4})$

21. _____

Name:

Date:

Instructor:

Section:

Section 3.7 Graphing Linear Inequalities

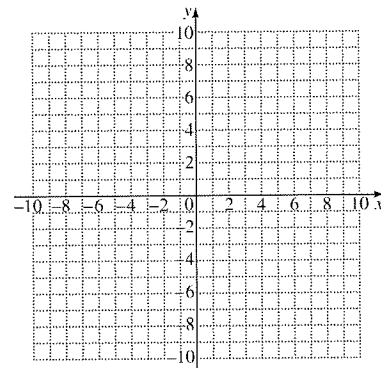
Learning Objectives

1. Graph linear inequalities.
2. Graph the intersection or union of two linear inequalities.

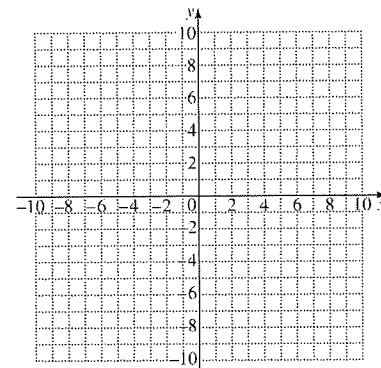
Objective 1

Graph each inequality.

1. $x > 4$



2. $y \leq \frac{1}{2}x - 5$



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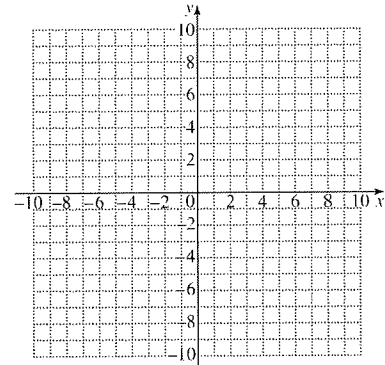
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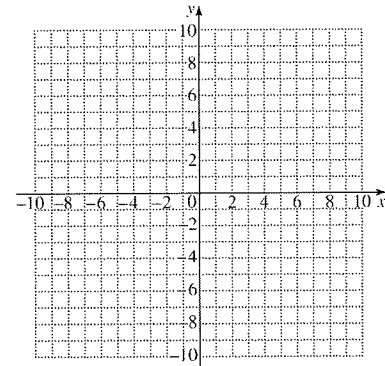
Section:



3. $3x + y > 6$



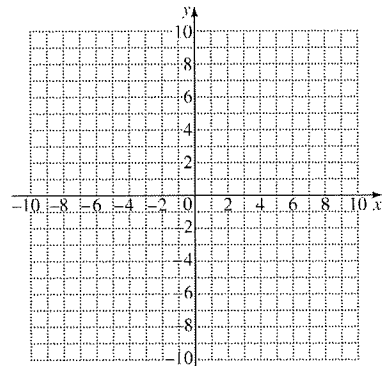
4. $2x - 4y < 16$



Objective 2



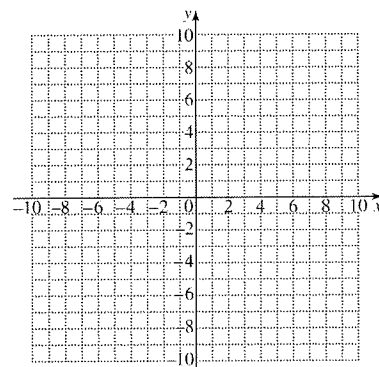
5. Graph the intersection of $x + y \leq 1$ and $y \leq -1$



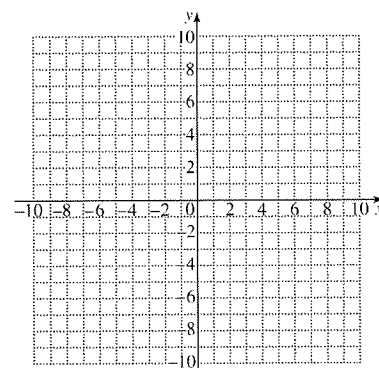
Name:
Instructor:

Date:
Section:

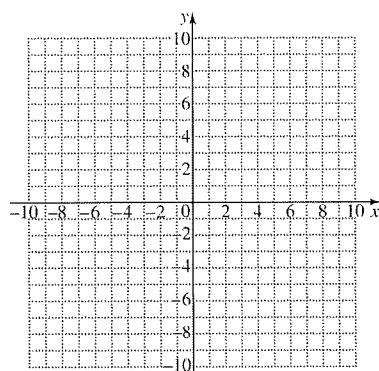
6. Graph the union of $x + y > 4$ and $x > 2$



7. Graph the union of $2x + 3y \leq 6$ and $y < 2$



8. Graph the intersection of $x - y < -5$ and $x \geq -3$.



Name:

Date:

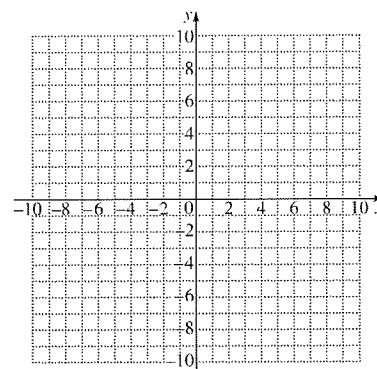
Instructor:

Section:

Concept Extension

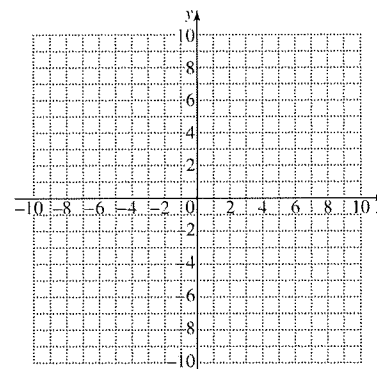
9. Graph the intersection of the following equations:

$$\begin{cases} x - y > 2 \\ y < 2x \\ y > 4 \end{cases}$$



10. Graph the union of the following equations:

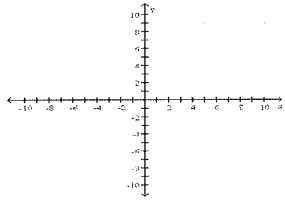
$$\begin{cases} x + y < 5 \\ y > 2x - 1 \\ x < -2 \end{cases}$$



Name:
Instructor:

Date:
Section:

Chapter 3 Vocabulary

Vocabulary Word	Definition	Example
Rectangular coordinate system	A plane that contains a vertical (y) and horizontal (x) axes. The intersection of the axes is called the origin.	
Solution	An ordered pair that makes the equation true.	$y = 3x + 2$ Solution $(-2, -4)$ $-4 = 3(-2) + 2$
Linear Equation in Two Variables	An equation that can be written in standard form: $Ax + By = C$	$5x - 4y = 12$ $y = 2x - 8$
Intercept	A point on the graph where it hits a specific axis.	$y = 2x + 8$ Hits the y axis at 8.
Slope (m)	Rate of change. Steepness of the graph.	$\frac{y_2 - y_1}{x_2 - x_1}$
Slope-Intercept Form.	$y = mx + b$ where m is the slope and b is the y-intercept.	$y = 4x - 9$
Point-Slope Form	$y - y_1 = m(x - x_1)$ where m is the slope and the point (x_1, y_1)	Given $m = 2$ and $(1, 3)$ then $y - 3 = 2(x - 1)$
Relation	Set of ordered pairs. A function is a special relation that the x values do not repeat. For every x-value there is only one y-value.	$\{(1, 2)(2, 3)(4, 5)\}$ Is a function as well.
Domain	Set of all the x-values in a relation.	For the relation above: $D = \{1, 2, 4\}$
Range	Set of all the y-values in a relation.	For the relation above: $R = \{2, 3, 5\}$
$f(x)$	Function notation. A function of x .	$f(x) = 3x + 2$

Name:

Date:

Instructor:

Section:

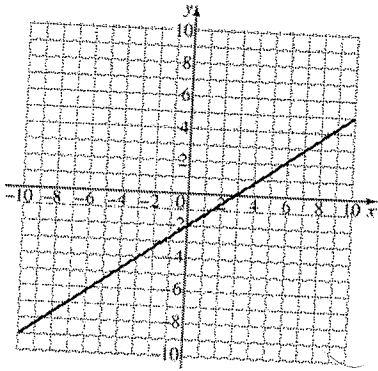
Linear function	A function that can be written as $f(x) = mx + b$.	$f(x) = 3x - 6$
Vertical Shifts	$g(x) = f(x) + k$; If k positive, graph shifts up; if k is negative, graph shifts down.	$f(x) = x^2 + 3$; graph is three units higher than $f(x) = x^2$
Horizontal Shifts	$g(x) = f(x - h)$; If h is positive, graph shifts to the right; if h is negative, graph shifts to the left.	$f(x) = x - 4 $; graph is 4 units to the right of $f(x) = x $
Linear Inequality in Two Variables	$f(x) < ax + b$ $f(x) \geq ax + b$	$f(x) > 2x - 6$

Answers

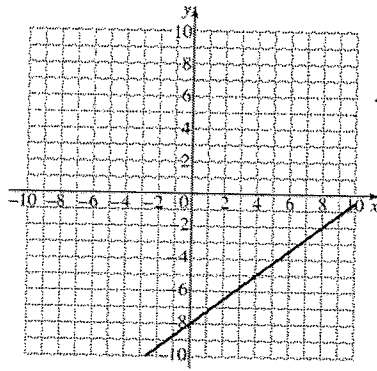
Chapter 3
Section 3.1

1. 10 to the left, 16 up; II
2. 5 to the right, 9 down; IV
3. 7 to the right, 19 up; I
4. 15 to the left, 18 down; III
5. No
6. Yes
7. No
8. No

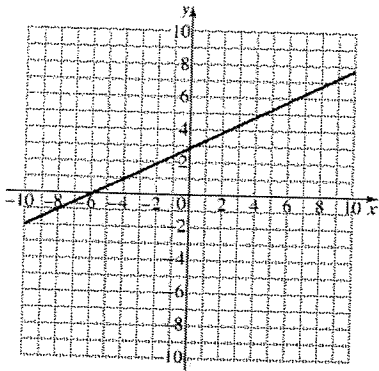
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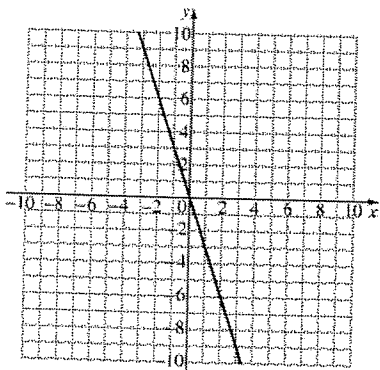
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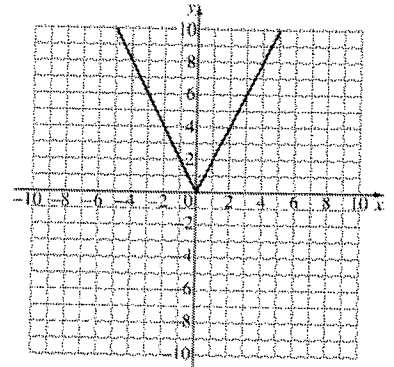
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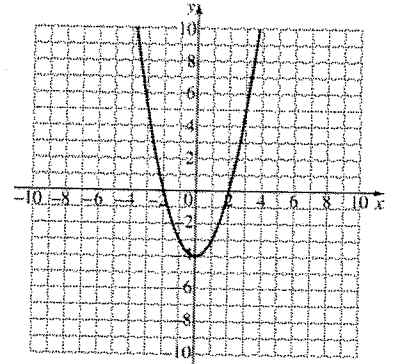
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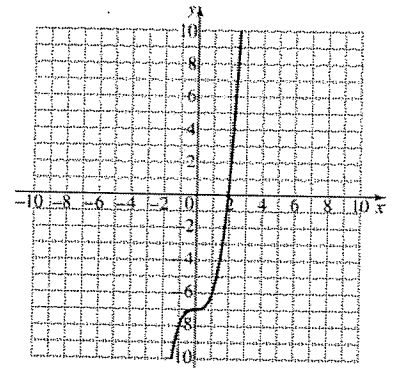
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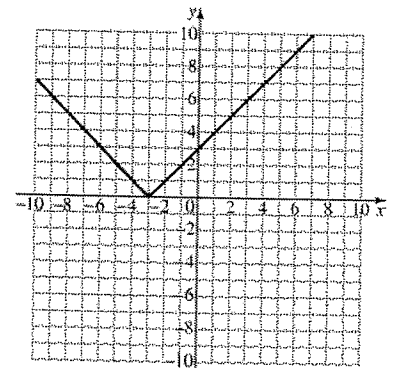
14.



15.



16.



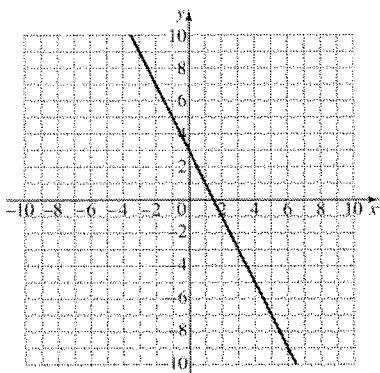
17. The second graph shifts 2 units to the right, and 5 units up.

Section 3.2

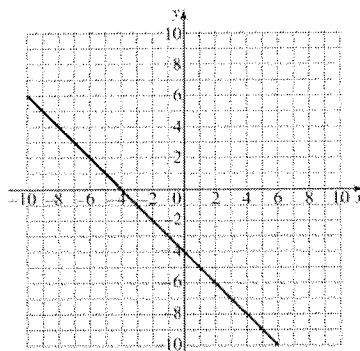
1. Function
2. Domain
3. y
4. Vertical
5. Relation
6. Range
7. x
8. $D = \{-2, -4, 8\}$; $R = \{4, -9, 6, 8\}$
9. $D = \{1, -7, 0, 12\}$; $R = \{7, 3, -6, 15\}$
10. $D = \{-12, 33, -72, 110\}$;
 $R = \{16, 45, 99, -114\}$
11. Yes
12. No
13. Yes
14. No
15. Yes
16. Yes
17. No
18. $D = (-\infty, \infty)$; $R = 4$
19. $D = (-\infty, \infty)$; $R = (-\infty, \infty)$
20. 38
21. 24
22. 133
23. $3a - 4$; $3a - 3h - 4$
24. 3

Section 3.3

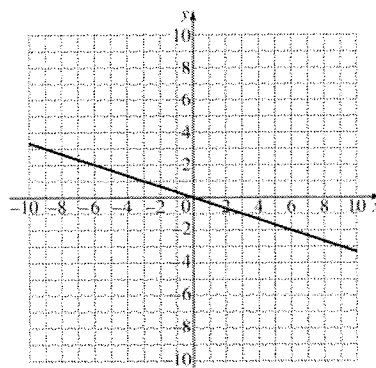
1. Horizontal
2. Linear
3. Vertical
4. m ; b ; y
- 5.



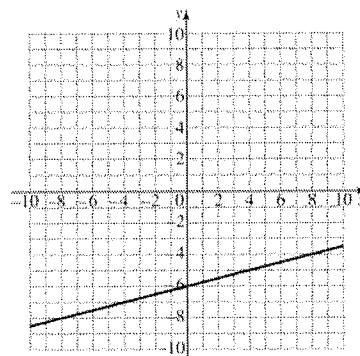
6.



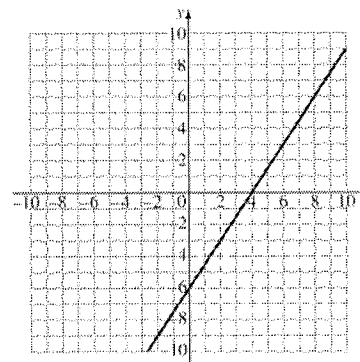
7.



8.

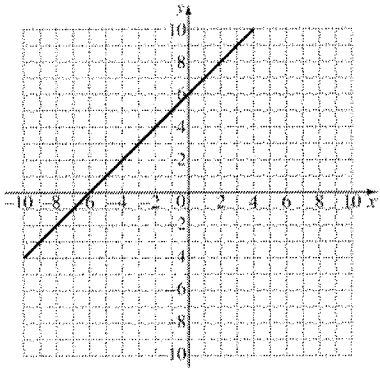


9.

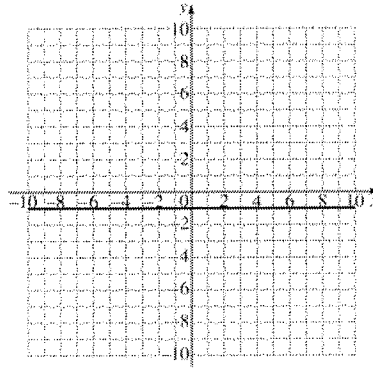


Answers

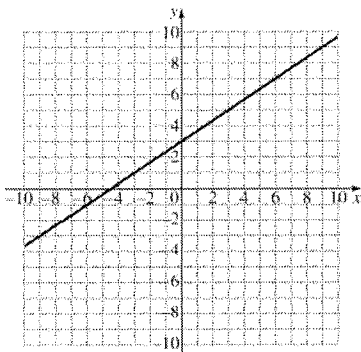
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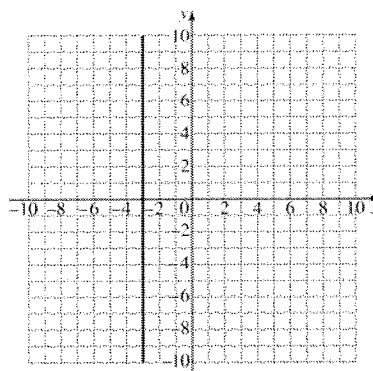
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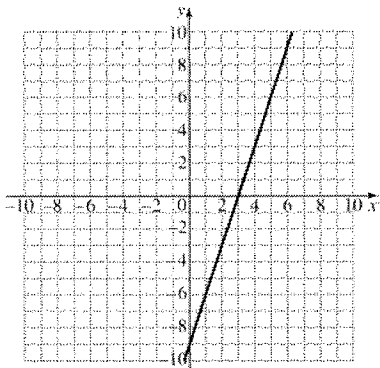
11.



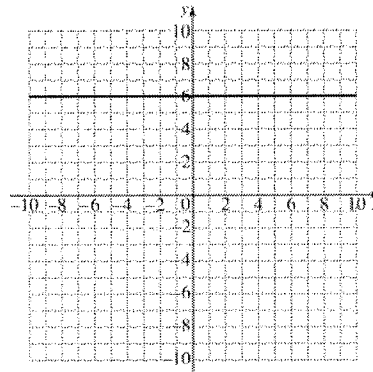
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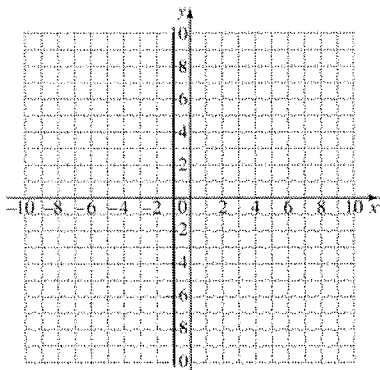
12.



16.



13.



17. coefficient = 0; slope = 0

Section 3.4

1. Equal; Different
2. Undefined
3. Slope
4. Perpendicular
5. Slope-Intercept
6. 0
7. $\frac{1}{3}$
8. 3

9. undefined

10. $\frac{1}{5}$

11. $\frac{4}{7}$

12. -5

13a. $m = 33$; y-intercept (0, 42)

13b. The number of WiFi hotspots increase by 33 thousand every year.

13c. There were 42 thousand hotspots in 2003.

14a. slope = 0.25; y-intercept: (0, 64)

14b. It cost \$0.25 per mile to rent the car.

14c. The daily rate to rent the car is \$64

15. undefined

16. 0

17. undefined

18. 0

19. Neither

20. Parallel

21. Perpendicular

22. $-\frac{7}{4}$

23. $\frac{4}{5}$

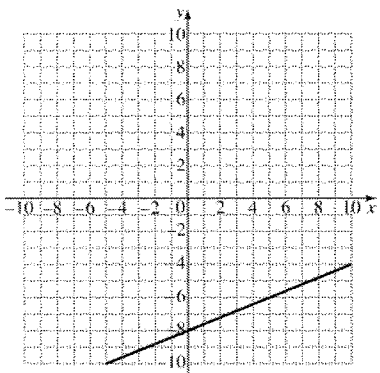
Section 3.5

1. $y = -2x - 4$

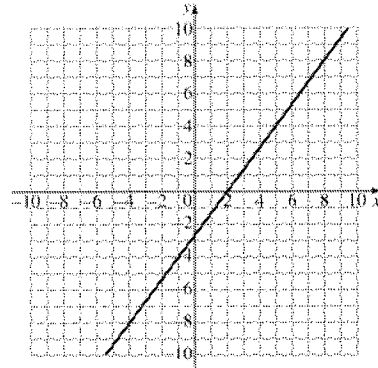
2. $y = \frac{2}{3}x + 6$

3. $y = -\frac{3}{5}x - \frac{7}{9}$

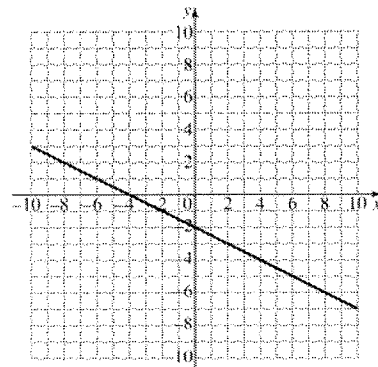
4.



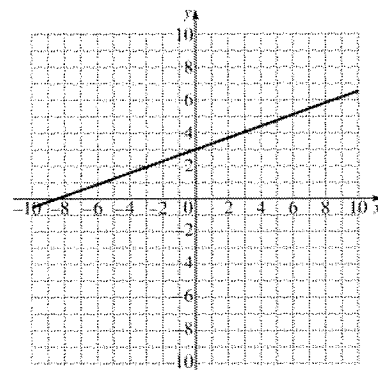
5.



6.



7.



8. $y = 3x - 1$

9. $y = \frac{1}{4}x - 5$

10. $y = -\frac{2}{5}x - \frac{14}{5}$

11. $y = -7x + \frac{41}{10}$

12. $y = -5$

13. $x = 2$

14. $x = -5$

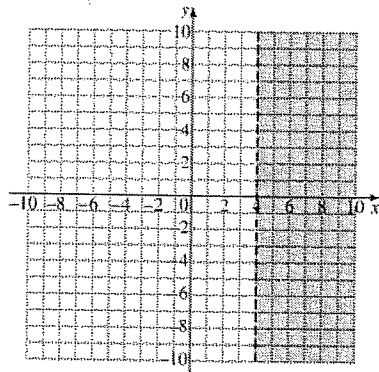
15. $y = -\frac{1}{3}$

Answers

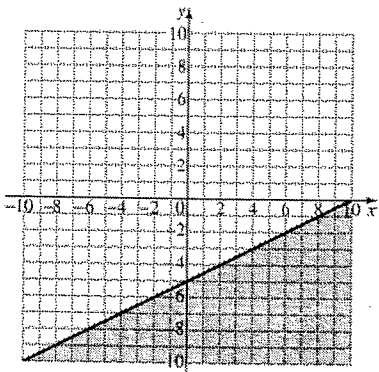
16. $f(x) = -3x + 1$
17. $f(x) = \frac{1}{3}x - \frac{10}{3}$
18. $f(x) = -5$
19. $f(x) = -\frac{3}{2}x - 23$
20. $f(x) = \frac{1}{3}x - 7$
21. $f(x) = -\frac{13}{19}x + \frac{43}{380}$

Section 3.7

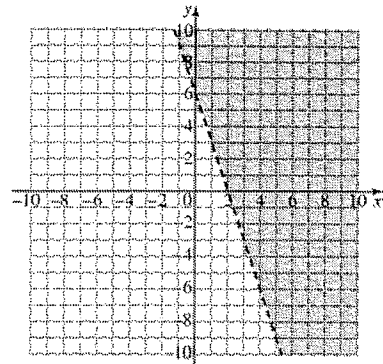
1.



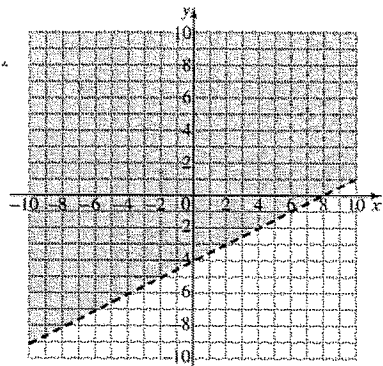
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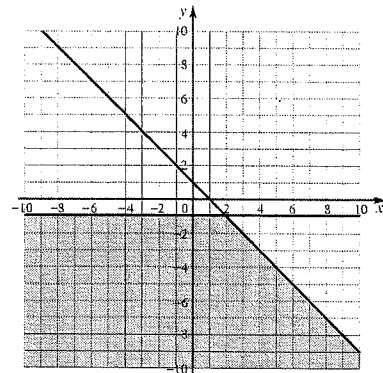
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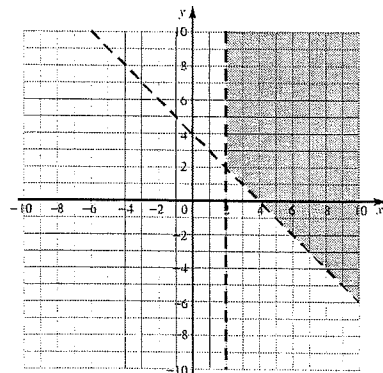
4.



5.

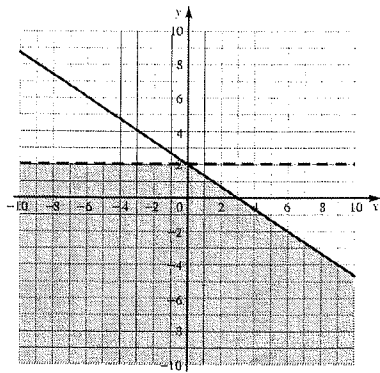


6.

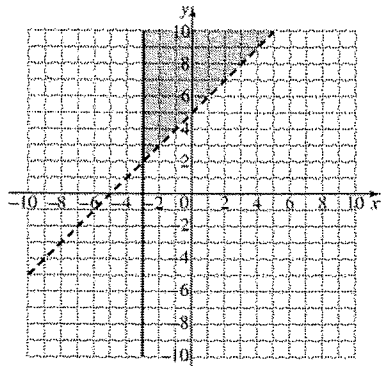


Answers

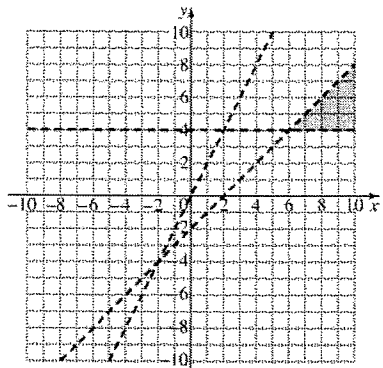
7.



8.



9.



10.

