Chapter 13

26. a. Let y be the monthly income and x be the number of clicks.

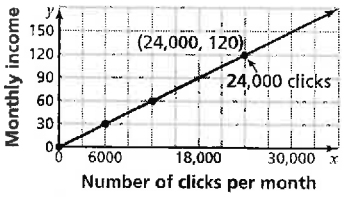
An equation is $y = 0.005x$.

b. The slope is 0.005, and the y-intercept is 0. Plot $(0, 0)$.

Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{0.005}{1} = \frac{0.005}{1} \cdot \frac{6000}{6000} = \frac{30}{6000}$$

Plot the point that is 6000 units right and 30 units up from $(0, 0)$. Draw a line through the two points.



When the ads start to get 24,000 clicks per month, the income will be \$120 per month, which equals the cost of operating the website. Each banner ad needs to average $\frac{24{,}000}{5} = 4800$ clicks. Any additional clicks per month will start earning a profit.

Fair Game Review

27. $y - 2x = 3$

$y = 2x + 3$

28. $4x + 5y = 13$

$5y = -4x + 13$

$y = -\frac{4}{5}x + \frac{13}{5}$

29. $2x - 3y = 6$

$-3y = -2x + 6$

$y = \frac{2}{3}x - 2$

30. $7x + 4y = 8$

$4y = -7x + 8$

$y = -\frac{7}{4}x + 2$

31. B; $3x - 8y = 11$

$3(1) - 8(-1) \stackrel{?}{=} 11$

$3 + 8 \stackrel{?}{=} 11$

$11 = 11$ ✓

The point $(1, -1)$ is a solution of the equation.

Section 13.5

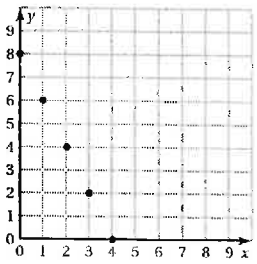
13.5 Activity (pp. 596–597)

1. a. An equation is $4x + 2y = 16$.

b.

Number of Adult Tickets, x	0	1	2	3	4
Number of Student Tickets, y	8	6	4	2	0

c.



The points lie on a line.

d. yes; If you remember how many adult tickets you sold, you can determine how many student tickets you sold by substituting the number of adult tickets for x in the equation and then solving the equation for y.

2. a. An equation is $4x + 2y = 16$.

b. $4x + 2y = 16$

$2y = -4x + 16$

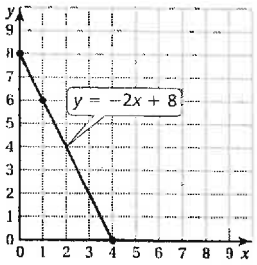
$y = -2x + 8$

The slope is -2, and the y-intercept is 8. Plot $(0, 8)$.

Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{-2}{1}$$

Plot the point that is 1 unit right and 2 units down from $(0, 8)$. Draw a line through the two points.



c. $4x + 2(2) = 16$

$4x + 4 = 16$

$4x = 12$

$x = 3$

You sold 3 pounds of swiss cheese.

d. yes; You can have 2.5 pounds of swiss cheese.

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3. The graph of the equation $ax + by = c$ is a line. The slope is $-\frac{a}{b}$, and the y-intercept is $\frac{c}{b}$.

4. In Activity 1, a table of values is created and the points from the table are plotted. Then a line is drawn through the points. In Activity 2, the equation is rewritten in slope-intercept form and then the slope and y-intercept are used to graph the line.

Sample answer: The method in Activity 2 may be considered easier because it involves plotting fewer points.

5. *Sample answer:* You buy x pounds of dog food for \$3 a pound and y pounds of cat food for \$1.50 per pound. Your total bill is \$15. You can't remember how many pounds of each type of food you bought.

$$\frac{\$3}{\text{lb}} \cdot \frac{\text{Pounds of}}{\text{dog food}} + \frac{\$1.50}{\text{lb}} \cdot \frac{\text{Pounds of}}{\text{cat food}} = \$15$$

6. Graphing the equation using standard form is easier because you can see that when $x = 0$, $y = 10$, and when $y = 0$, $x = 10$. You can graph the equation using its x-intercept and its y-intercept.

13.5 On Your Own (pp. 598–599)

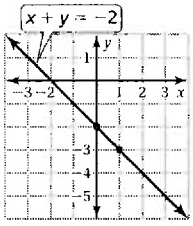
1. $x + y = -2$

$$y = -x - 2$$

The slope is -1, and the y-intercept is -2. Plot $(0, -2)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{-1}{1}$$

Plot the point that is 1 unit right and 1 unit down from $(0, -2)$. Draw a line through the points.



2. $-\frac{1}{2}x + 2y = 6$

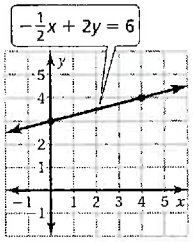
$$2y = \frac{1}{2}x + 6$$

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

The slope is $\frac{1}{4}$, and the y-intercept is 3. Plot $(0, 3)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{1}{4}$$

Plot the point that is 4 units right and 1 unit up from $(0, 3)$. Draw a line through the points.



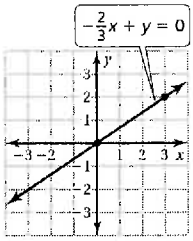
3. $-\frac{2}{3}x + y = 0$

$$y = \frac{2}{3}x$$

The slope is $\frac{2}{3}$, and the y-intercept is 0. Plot $(0, 0)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{2}{3}$$

Plot the point that is 3 units right and 2 units up from $(0, 0)$. Draw a line through the points.



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Chapter 13

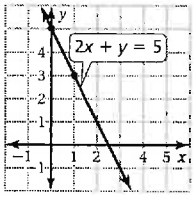
4. $2x + y = 5$

$y = -2x + 5$

The slope is -2, and the y-intercept is 5. Plot $(0, 5)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{-2}{1}$$

Plot the point that is 1 unit right and 2 units down from $(0, 5)$. Draw a line through the points.



5. $2x - y = 8$

$2x - 0 = 8$

$2x = 8$

$x = 4$

The x-intercept is 4.

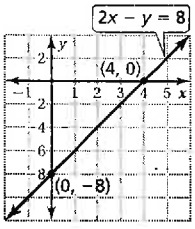
$2x - y = 8$

$2(0) - y = 8$

$-y = 8$

$y = -8$

The y-intercept is -8.



6. $x + 3y = 6$

$x + 3(0) = 6$

$x = 6$

The x-intercept is 6.

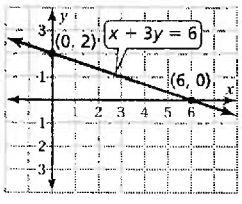
$x + 3y = 6$

$0 + 3y = 6$

$3y = 6$

$y = 2$

The y-intercept is 2.



7. $1.5x + 1.2y = 6$

$1.5x + 1.2(0) = 6$

$1.5x = 6$

$x = 4$

The x-intercept is 4.

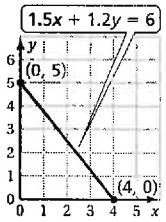
$1.5x + 1.2y = 6$

$1.5(0) + 1.2y = 6$

$1.2y = 6$

$y = 5$

The y-intercept is 5.



The x-intercept shows that you can buy 4 pounds of apples when you do not buy any oranges. The y-intercept shows that you can buy 5 pounds of oranges when you do not buy any apples.

13.5 Exercises (pp. 600–601)

Vocabulary and Concept Check

1. no; The equation $y = -2x + 5$ is not in standard form because it is not written in the form $ax + by = c$.

2. *Sample answer:*

1) Write the equation in slope-intercept form and use the slope and y-intercept to graph the equation.

2) Find the x- and y-intercepts, plot the points representing the intercepts, and draw a line through the points.

Practice and Problem Solving

3. Let x be the number of pounds of peaches and y be the number of pounds of apples.

$2x + 1.5y = 15$

$1.5y = -2x + 15$

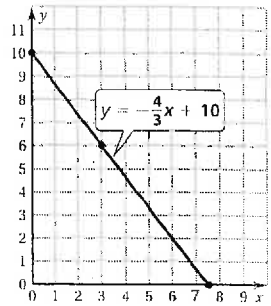
$y = -\frac{4}{3}x + 10$

The slope is $-\frac{4}{3}$, and the y-intercept is 10. Plot $(0, 10)$.

Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{-4}{3}$$

Plot the point that is 3 units right and 4 units down from $(0, 10)$. Draw a line through the points.



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4. Let x be the number of hours biked and y be the number of hours walked.

$16x + 2y = 32$

$2y = -16x + 32$

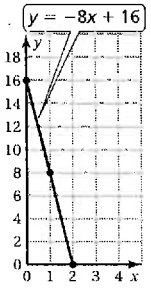
$y = -8x + 16$

The slope is -8, and the y-intercept is 16. Plot $(0, 16)$.

Use the slope to find another point on the line.

$m = \frac{\text{rise}}{\text{run}} = \frac{-8}{1}$

Plot the point that is 1 unit right and 8 units down from $(0, 16)$. Draw a line through the points.



5. $2x + y = 17$

$y = -2x + 17$

6. $5x - y = \frac{1}{4}$

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

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

7. $-\frac{1}{2}x + y = 10$

$y = \frac{1}{2}x + 10$

8. $-18x + 9y = 72$

$9y = 18x + 72$

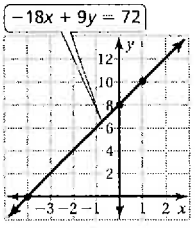
$y = 2x + 8$

The slope is 2, and the y-intercept is 8. Plot $(0, 8)$.

Use the slope to find another point on the line.

$m = \frac{\text{rise}}{\text{run}} = \frac{2}{1}$

Plot the point that is 1 unit right and 2 units up from $(0, 8)$. Draw a line through the points.



9. $16x - 4y = 2$

$-4y = -16x + 2$

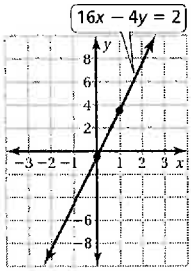
$y = 4x - \frac{1}{2}$

The slope is 4, and the y-intercept is $-\frac{1}{2}$. Plot $\left(0, -\frac{1}{2}\right)$.

Use the slope to find another point on the line.

$m = \frac{\text{rise}}{\text{run}} = \frac{4}{1}$

Plot the point that is 1 unit right and 4 units up from $\left(0, -\frac{1}{2}\right)$. Draw a line through the points.



10. $\frac{1}{4}x + \frac{3}{4}y = 1$

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

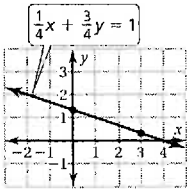
$y = -\frac{1}{3}x + \frac{4}{3}$

The slope is $-\frac{1}{3}$, and the y-intercept is $\frac{4}{3}$. Plot $\left(0, \frac{4}{3}\right)$.

Use the slope to find another point on the line.

$m = \frac{\text{rise}}{\text{run}} = \frac{-1}{3}$

Plot the point that is 3 units right and 1 unit down from $\left(0, \frac{4}{3}\right)$. Draw a line through the points.



11. B;

$15x - 12y = 60$

$15x - 12(0) = 60$

$15x = 60$

$x = 4$

The x-intercept is 4.

$15x - 12y = 60$

$15(0) - 12y = 60$

$-12y = 60$

$y = -5$

The y-intercept is -5.

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12. A; $5x + 4y = 20$

$5x + 4(0) = 20$

$5x = 20$

$x = 4$

The x-intercept is 4.

$5x + 4y = 20$

$5(0) + 4y = 20$

$4y = 20$

$y = 5$

The y-intercept is 5.

13. C; $10x + 8y = -40$

$10x + 8(0) = -40$

$10x = -40$

$x = -4$

The x-intercept is -4.

$10x + 8y = -40$

$10(0) + 8y = -40$

$8y = -40$

$y = -5$

The y-intercept is -5.

14. To find the x-intercept, 0 should have been substituted for y, not for x.

$-2x + 3y = 12$

$-2x + 3(0) = 12$

$-2x = 12$

$x = -6$

The x-intercept is -6.

15. a. $-25x + y = 65$

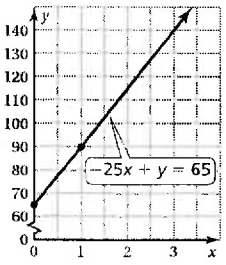
$y = 25x + 65$

The slope is 25, and the y-intercept is 65. Plot $(0, 65)$.

Use the slope to find another point on the line.

$m = \frac{\text{rise}}{\text{run}} = \frac{25}{1}$

Plot the point that is 1 unit right and 25 units up from $(0, 65)$. Draw a line through the points.



b. The bracelet shown has 13 charms. So, $x = 13$.

$y = 25x + 65 = 25(13) + 65 = 325 + 65 = 390$

The bracelet shown costs \$390.

16. $3x - 4y = -12$

$3x - 4(0) = -12$

$3x = -12$

$x = -4$

The x-intercept is -4.

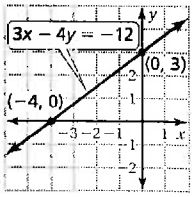
$3x - 4y = -12$

$3(0) - 4y = -12$

$-4y = -12$

$y = 3$

The y-intercept is 3.



18. $\frac{1}{3}x - \frac{1}{6}y = -\frac{2}{3}$

$\frac{1}{3}x - \frac{1}{6}(0) = -\frac{2}{3}$

$\frac{1}{3}x = -\frac{2}{3}$

$x = -2$

The x-intercept is -2.

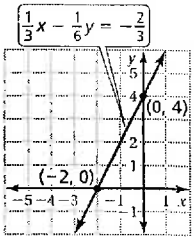
$\frac{1}{3}x - \frac{1}{6}y = -\frac{2}{3}$

$\frac{1}{3}(0) - \frac{1}{6}y = -\frac{2}{3}$

$-\frac{1}{6}y = -\frac{2}{3}$

$y = 4$

The y-intercept is 4.



17. $2x + y = 8$

$2x + 0 = 8$

$2x = 8$

$x = 4$

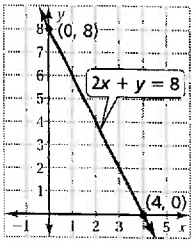
The x-intercept is 4.

$2x + y = 8$

$2(0) + y = 8$

$y = 8$

The y-intercept is 8.



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19. $14x + 18y = 126$

$14x + 18(0) = 126$

$14x = 126$

$x = 9$

The x-intercept is 9.

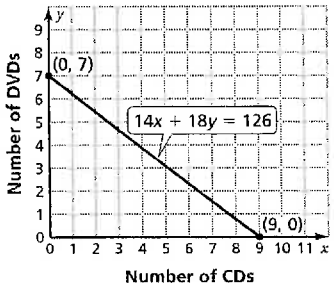
$14x + 18y = 126$

$14(0) + 18y = 126$

$18y = 126$

$y = 7$

The y-intercept is 7.



20. a. $\frac{\$250}{\text{day}} \cdot \begin{matrix}\text{Days}\\ \text{boat}\\ \text{rented}\end{matrix} + \frac{\$50}{\text{day}} \cdot \begin{matrix}\text{Days}\\ \text{gear}\\ \text{rented}\end{matrix} = \$1000$

Let x be the number of days the boat is rented and let y be the number of days the scuba gear is rented.

An equation is $250x + 50y = 1000$.

b. $250x + 50y = 1000$

$250x + 50(0) = 1000$

$250x = 1000$

$x = 4$

The x-intercept is 4. It shows that the friends could rent the boat for 4 days if they do not rent the scuba gear.

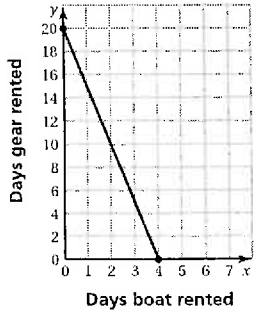
$250x + 50y = 1000$

$250(0) + 50y = 1000$

$50y = 1000$

$y = 20$

The y-intercept is 20. It shows that the friends could rent scuba gear for 20 days if they do not rent the boat.



21. a. $\frac{\$9.45}{\text{hour}} \cdot \begin{matrix}\text{Hours}\\ \text{worked}\\ \text{as host}\end{matrix} + \frac{\$7.65}{\text{hour}} \cdot \begin{matrix}\text{Hours}\\ \text{worked}\\ \text{as server}\end{matrix} = \$160.65$

Let x be the number of hours worked as host and let y be the number of hours worked as server.

An equation is $9.45x + 7.65y = 160.65$.

b. $9.45x + 7.65y = 160.65$

$9.45x + 7.65(0) = 160.65$

$9.45x = 160.65$

$x = 17$

The x-intercept is 17.

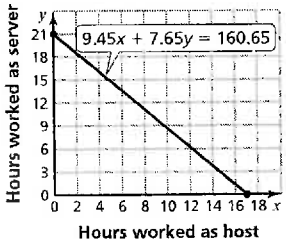
$9.45x + 7.65y = 160.65$

$9.45(0) + 7.65y = 160.65$

$7.65y = 160.65$

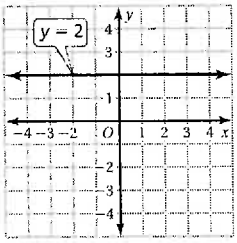
$y = 21$

The y-intercept is 21.



22. no; Horizontal lines of the form $y = a$, where a is not equal to 0, do not have an x-intercept.

Sample answer: The graph of $y = 2$ does not have an x-intercept because it does not cross the x-axis.



23. a. Total fee $= \frac{\text{Cost per}}{\text{hour}} \cdot \text{Number of hours} + \text{Initial fee}$

Let y be the total fee charged and let x be the number of hours the visit lasts.

An equation is $y = 40x + 70$.

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b. $y = 40x + 70$

$0 = 40x + 70$

$-70 = 40x$

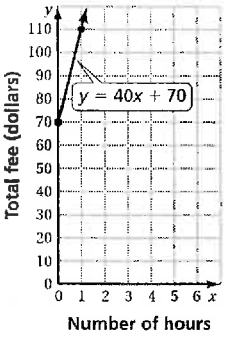
$-1.75 = x$

The x-intercept is -1.75. This value does not make sense because you cannot have a negative number of hours.

c. From the equation $y = 40x + 70$, the slope is 40 and the y-intercept is 70. Plot $(0, 70)$. Use the slope to find another point on the line.

$m = \frac{\text{rise}}{\text{run}} = \frac{40}{1}$

Plot the point that is 1 unit right and 40 units up from $(0, 70)$. Draw a line through the points.



Fair Game Review

24. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - (-2)}{1 - 0} = \frac{4}{1} = 4$

The slope is 4.

25. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 2}{4 - 2} = \frac{1}{2}$

The slope is $\frac{1}{2}$.

26. D; $4x - 12 = 3x - 9$

$4x = 3x + 3$

$x = 3$

Section 13.6

13.6 Activity (pp. 602–603)

1. a. Blue line: $m = \frac{\text{rise}}{\text{run}} = \frac{1}{2}$

The slope of the blue line is $\frac{1}{2}$.

The blue line crosses the y-axis at $(0, 4)$. So, the y-intercept is 4.

An equation of the blue line is $y = \frac{1}{2}x + 4$.

Red line: $m = \frac{\text{rise}}{\text{run}} = \frac{1}{2}$

The slope of the red line is $\frac{1}{2}$.

The red line crosses the y-axis at $(0, 1)$. So, the y-intercept is 1.

An equation of the red line is $y = \frac{1}{2}x + 1$.

Green line: $m = \frac{\text{rise}}{\text{run}} = \frac{1}{2}$

The slope of the green line is $\frac{1}{2}$.

The green line crosses the y-axis at $(0, -2)$. So, the y-intercept is -2.

An equation of the green line is $y = \frac{1}{2}x - 2$.

All three lines have a slope of $\frac{1}{2}$. So, the lines are parallel.

b. Blue line: $m = \frac{\text{rise}}{\text{run}} = \frac{-4}{2} = -2$

The slope of the blue line is -2.

The blue line crosses the y-axis at $(0, 3)$. So, the y-intercept is 3.

An equation of the blue line is $y = -2x + 3$.

Red line: $m = \frac{\text{rise}}{\text{run}} = \frac{-4}{2} = -2$

The slope of the red line is -2.

The red line crosses the y-axis at $(0, -1)$. So, the y-intercept is -1.

An equation of the red line is $y = -2x - 1$.

Green line: $m = \frac{\text{rise}}{\text{run}} = \frac{-4}{2} = -2$

The slope of the green line is -2.

The green line crosses the y-axis at $(0, -5)$. So, the y-intercept is -5.

An equation of the green line is $y = -2x - 5$.

All three lines have a slope of 2. So, the lines are parallel.

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c. Blue line: $m = \frac{\text{rise}}{\text{run}} = \frac{-1}{3} = -\frac{1}{3}$

The slope of the blue line is $-\frac{1}{3}$.

The blue line crosses the y-axis at $(0, 3)$. So, the y-intercept is 3.

An equation of the blue line is $y = -\frac{1}{3}x + 3$.

Red line: $m = \frac{\text{rise}}{\text{run}} = \frac{4}{3}$

The slope of the red line is $\frac{4}{3}$.

The red line crosses the y-axis at $(0, 3)$. So, the y-intercept is 3.

An equation of the red line is $y = \frac{4}{3}x + 3$.

Green line: $m = \frac{\text{rise}}{\text{run}} = \frac{1}{6}$

The slope of the green line is $\frac{1}{6}$.

The green line crosses the y-axis at $(0, 3)$. So, the y-intercept is 3.

An equation of the green line is $y = \frac{1}{6}x + 3$.

All three lines have a y-intercept of 3.

d. Blue line: $m = \frac{\text{rise}}{\text{run}} = \frac{2}{1} = 2$

The slope of the blue line is 2.

The blue line crosses the y-axis at $(0, 0)$. So, the y-intercept is 0.

An equation of the blue line is $y = 2x$.

Red line: $m = \frac{\text{rise}}{\text{run}} = \frac{-1}{1} = -1$

The slope of the red line is -1.

The red line crosses the y-axis at $(0, 0)$. So, the y-intercept is 0.

An equation of the red line is $y = -x$.

Green line: $m = \frac{\text{rise}}{\text{run}} = \frac{1}{3}$

The slope of the green line is $\frac{1}{3}$.

The green line crosses the y-axis at $(0, 0)$. So, the y-intercept is 0.

An equation of the green line is $y = \frac{1}{3}x$.

All three lines have a y-intercept of 0.

2. a. Area = base • height = $7 \cdot 6 = 42$

The area of the parallelogram is 42 square units.

The bottom side of the parallelogram is a horizontal line passing through $(0, -2)$. So, an equation for the bottom side is $y = -2$.

The top side of the parallelogram is a horizontal line passing through $(0, 4)$. So, an equation for the top side is $y = 4$.

Right side: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 4}{5 - 2} = \frac{-6}{3} = -2$

The slope of the right side of the parallelogram is -2. The side passes through $(4, 0)$.

$y = mx + b$

$0 = -2(4) + b$

$0 = -8 + b$

$8 = b$

The y-intercept is 8. So, an equation for the right side is $y = -2x + 8$.

Left side: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 4}{-2 - (-5)} = \frac{-6}{3} = -2$

The slope of the left side of the parallelogram is -2. The side passes through $(-3, 0)$.

$y = mx + b$

$0 = -2(-3) + b$

$0 = 6 + b$

$-6 = b$

The y-intercept is -6. So, an equation for the left side is $y = -2x - 6$.

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Chapter 13

b. Area = base • height = 4 • 7 = 28

The area of the parallelogram is 28 square units.

The bottom side of the parallelogram is a horizontal line passing through $(-3, -2)$. So, an equation for the bottom side is $y = -2$.

The top side of the parallelogram is a horizontal line passing through $(0, 5)$. So, an equation for the top side is $y = 5$.

Right side: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - (-2)}{4 - (-3)} = \frac{7}{7} = 1$

The slope of the right side of the parallelogram is 1. The side passes through $(-3, -2)$.

$y = mx + b$

$-2 = 1(-3) + b$

$-2 = -3 + b$

$1 = b$

The y-intercept is 1. So, an equation for the right side is $y = x + 1$.

Left side: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - (-2)}{0 - (-7)} = \frac{7}{7} = 1$

The slope of the left side of the parallelogram is 1. The side crosses the y-axis at $(0, 5)$. So, the y-intercept is 5. An equation for the left side is $y = x + 5$.

3. a. The y-intercept is 100. So, at the beginning of the trip, the car was 100 miles from Phoenix.

b. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{400 - 100}{6 - 0} = \frac{300}{6} = 50$

The slope is 50. So, the speed of the car was 50 miles per hour.

c. The point $(6, 400)$ represents the end of the trip.

So, the trip lasted 6 hours.

d. The point $(6, 400)$ represents the end of the trip.

So, at the end of the trip, the car was 400 miles from Phoenix.

e. Using the y-intercept from part (a) and the slope from part (b), an equation is $y = 50x + 100$.

4. The slope-intercept form of the equation of a line is $y = mx + b$. If you are given the slope and y-intercept, substitute the slope for m, and the y-intercept for b to write an equation of the line.

Sample answer: An equation of the line with a slope of 3 and a y-intercept of -1 is $y = 3x - 1$.

5. *Sample answer:* The opposite sides of a parallelogram are parallel. Because one of the sides is represented by the equation $y = 2x + 1$, the side opposite should have a slope of 2. Because one of the sides is represented by the equation $y = -x + 3$, the side opposite should have a slope of -1. So, the other two sides can be represented by the equations $y = 2x + 5$ and $y = -x + 7$.

13.6 On Your Own (pp. 604–605)

1. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 2}{1 - 0} = \frac{2}{1} = 2$

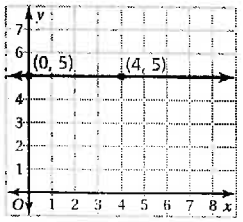
Because the line crosses the y-axis at $(0, 2)$, the y-intercept is 2. So, the equation is $y = 2x + 2$.

2. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - (-1)}{3 - 0} = \frac{-4}{3} = -\frac{4}{3}$

Because the line crosses the y-axis at $(0, -1)$, the y-intercept is -1. So, the equation is $y = -\frac{4}{3}x - 1$.

3. The line is horizontal, so the change in y is 0.

$m = \frac{\text{change in } y}{\text{change in } x} = \frac{0}{4} = 0$



Because the line crosses the y-axis at $(0, 5)$, the y-intercept is 5. So, the equation is $y = 0x + 5$, or $y = 5$.

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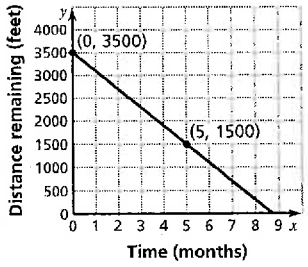
4. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1500 - 3500}{5 - 0} = \frac{-2000}{5} = -400$



Because the line crosses the y-axis at $(0, 3500)$, the y-intercept is 3500. So, the equation is $y = -400x + 3500$. The tunnel is complete when the distance remaining is 0 feet. So, find the value of x when $y = 0$.

$$\begin{aligned} y &= -400x + 3500 \\ 0 &= -400x + 3500 \\ -3500 &= -400x \\ 8.75 &= x \end{aligned}$$

It takes 8.75 months to complete the tunnel.

13.6 Exercises (pp. 606–607)

Vocabulary and Concept Check

1. *Sample answer:* Find the ratio of the rise to the run between the intercepts.

2. *Sample answer:* To write an equation of a line using its graph, find the slope and y-intercept. Then use the slope and y-intercept to write an equation of the line in slope-intercept form, $y = mx + b$, where m is the slope and b is the y-intercept.

Practice and Problem Solving

3. The bottom side of the parallelogram is a horizontal line passing through $(0, -1)$. So, an equation for the bottom side is $y = -1$.

The top side of the parallelogram is a horizontal line passing through $(1, 5)$. So, an equation for the top side is $y = 5$.

Right side: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - (-1)}{5 - 3} = \frac{6}{2} = 3$

The slope of the right side of the parallelogram is 3. The side passes through $(4, 2)$.

$$\begin{aligned} y &= mx + b \\ 2 &= 3(4) + b \\ 2 &= 12 + b \\ -10 &= b \end{aligned}$$

The y-intercept is -10. So, an equation for the right side is $y = 3x - 10$.

Left side: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - (-1)}{1 - (-1)} = \frac{6}{2} = 3$

The slope of the left side of the parallelogram is 3. The side passes through $(0, 2)$. So, the y-intercept is 2. An equation for the left side is $y = 3x + 2$.

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4. The bottom side of the hexagon is a horizontal line passing through $(0, -3)$. So, an equation for the bottom side is $y = -3$.

The top side of the hexagon is a horizontal line passing through $(0, 3)$. So, an equation for the top side is $y = 3$.

Bottom right side: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-3)}{4 - 2} = \frac{3}{2}$

The slope of the bottom right side of the hexagon is $\frac{3}{2}$.

The side passes through $(4, 0)$.

$y = mx + b$

$0 = \frac{3}{2}(4) + b$

$0 = 6 + b$

$-6 = b$

The y-intercept is -6. So, an equation for the bottom right side is $y = \frac{3}{2}x - 6$.

Top right side: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 3}{4 - 2} = \frac{-3}{2} = -\frac{3}{2}$

The slope of the top right side of the hexagon is $-\frac{3}{2}$.

The side passes through $(4, 0)$.

$y = mx + b$

$0 = -\frac{3}{2}(4) + b$

$0 = -6 + b$

$6 = b$

The y-intercept is 6. So, an equation for the top right side is $y = -\frac{3}{2}x + 6$.

Bottom left side:

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 0}{-2 - (-4)} = \frac{-3}{2} = -\frac{3}{2}$

The slope of the bottom left side of the hexagon is $-\frac{3}{2}$.

The side passes through $(-4, 0)$.

$y = mx + b$

$0 = -\frac{3}{2}(-4) + b$

$0 = 6 + b$

$-6 = b$

The y-intercept is -6. So, an equation for the bottom left side is $y = -\frac{3}{2}x - 6$.

Top left side: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 0}{-2 - (-4)} = \frac{3}{2}$

The slope of the top left side of the hexagon is $\frac{3}{2}$.

The side passes through $(-4, 0)$.

$y = mx + b$

$0 = \frac{3}{2}(-4) + b$

$0 = -6 + b$

$6 = b$

The y-intercept is 6. So, an equation for the top left side is $y = \frac{3}{2}x + 6$.

5. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 3}{0 - (-1)} = \frac{1}{1} = 1$

Because the line crosses the y-axis at $(0, 4)$, the y-intercept is 4. So, the equation is $y = x + 4$.

6. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 6}{0 - (-3)} = \frac{-6}{3} = -2$

Because the line crosses the y-axis at $(0, 0)$, the y-intercept is 0. So, the equation is $y = -2x$.

7. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 1}{4 - 0} = \frac{1}{4}$

Because the line crosses the y-axis at $(0, 1)$, the y-intercept is 1. So, the equation is $y = \frac{1}{4}x + 1$.

8. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 1}{4 - 0} = \frac{-2}{4} = -\frac{1}{2}$

Because the line crosses the y-axis at $(0, 1)$, the y-intercept is 1. So, the equation is $y = -\frac{1}{2}x + 1$.

9. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - (-3)}{3 - 0} = \frac{1}{3}$

Because the line crosses the y-axis at $(0, -3)$, the y-intercept is -3. So, the equation is $y = \frac{1}{3}x - 3$.

10. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 4}{0 - (-2)} = \frac{-5}{2} = -\frac{5}{2}$

Because the line crosses the y-axis at $(0, -1)$, the y-intercept is -1. So, the equation is $y = -\frac{5}{2}x - 1$.

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11. The wrong point was used to find the y-intercept. The line crosses the y-axis at $(0, -2)$. So, the y-intercept is -2, not 4. The equation of the line is $y = \frac{1}{2}x - 2$.

12. $\text{Length} = \frac{\text{Growth}}{\text{rate}} \cdot \frac{\text{Number}}{\text{of years}} + \frac{\text{Length}}{\text{at birth}}$

Let y be the length and let x be the number of years.

The length at birth is given in inches. Convert 18 inches to feet.

$$18 \text{ in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} = \frac{3}{2} \text{ ft}$$

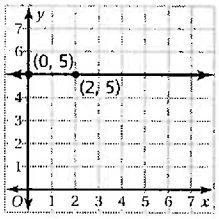
The growth rate is given in inches per year. Convert 8 inches per year to feet per year.

$$\frac{8 \text{ in.}}{1 \text{ yr}} \times \frac{1 \text{ ft}}{12 \text{ in.}} = \frac{\frac{2}{3} \text{ ft}}{\text{yr}}$$

An equation is $y = \frac{2}{3}x + \frac{3}{2}$.

13. The line is horizontal, so the change in y is 0.

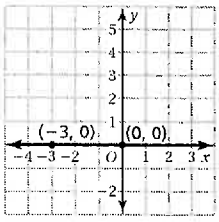
$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{0}{2} = 0$$



Because the line crosses the y-axis at $(0, 5)$, the y-intercept is 5. So, the equation is $y = 0x + 5$, or $y = 5$.

14. The line is horizontal, so the change in y is 0.

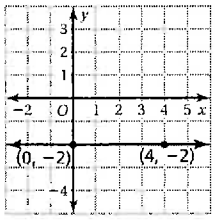
$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{0}{3} = 0$$



Because the line crosses the y-axis at $(0, 0)$, the y-intercept is 0. So, the equation is $y = 0x + 0$, or $y = 0$.

15. The line is horizontal, so the change in y is 0.

$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{0}{4} = 0$$



Because the line crosses the y-axis at $(0, -2)$, the y-intercept is -2. So, the equation is $y = 0x + (-2)$, or $y = -2$.

16. $\frac{\text{Amount}}{\text{raised}} = \frac{\text{Amount}}{\text{per mile}} \cdot \frac{\text{Number}}{\text{of miles}} + \frac{\text{Flat}}{\text{donation}}$

Let y be the amount raised and let x be the number of miles.

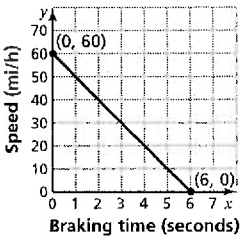
Equation: $y = mx + 10$

To find the slope, use the fact that after walking 5 miles, you have raised \$13.50.

$$y = mx + 10$$
$$13.50 = m(5) + 10$$
$$3.50 = 5m$$
$$0.7 = m$$

So, the slope is 0.7. An equation is $y = 0.7x + 10$.

17. a–b.



The point $(0, 60)$ represents the speed of the automobile before braking. The point $(6, 0)$ represents the time it takes to come to a complete stop. The line represents the speed y of the automobile after x seconds of braking.

c. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 60}{6 - 0} = \frac{-60}{6} = -10$

Because the line crosses the y-axis at $(0, 60)$, the y-intercept is 60. So, an equation of the line is $y = -10x + 60$.

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18. Number of pages remaining = Rate of use (sheets per week) • Number of weeks + 500 sheets

Let y be the number of pages remaining and let x be the number of weeks.

Equation: $y = mx + 500$

After 1 week, you have 72% of the sheets left. You started with 500 sheets, so find 72% of 500.

$0.72 \cdot 500 = 360$

To find the slope m, use the fact that after 1 week, you have 360 sheets remaining.

$y = mx + 500$

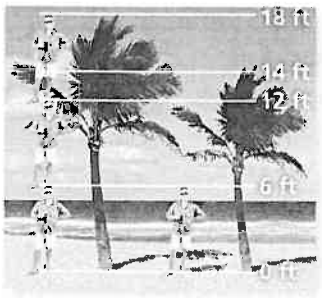
$360 = m(1) + 500$

$-140 = m$

So, an equation is $y = -140x + 500$.

19. *Sample answer:*

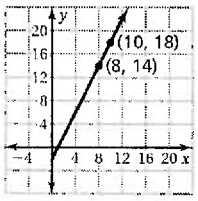
a. Estimate the heights in the photograph.



Height of 10-year-old tree: about 18 ft

Height of 8-year-old tree: about 14 ft

b. Plot the heights of the two trees.

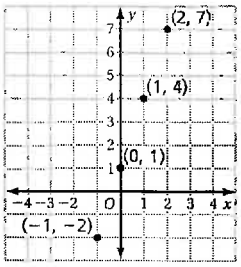


c. The trees are growing at a rate of about 2 feet per year. Because this would put the height of a 0-year-old tree at -2, it is better to adjust the rate of growth to be about 1.8 feet per year.

d. A possible equation for the growth rate is $y = 1.8x$.

Fair Game Review

20–23.

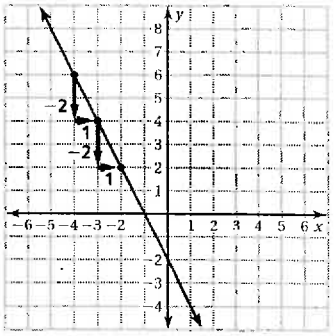


24. C; The line crosses the y-axis at $(0, 5)$. So, the y-intercept is 5.

Section 13.7

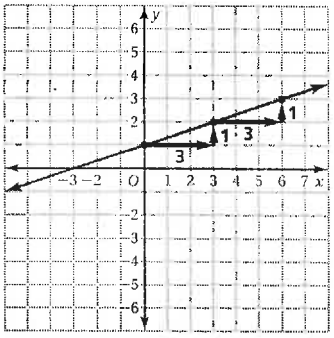
13.7 Activity (pp. 608–609)

1. a.



Because the line crosses the y-axis at $(0, -2)$, the y-intercept is -2. So, an equation of the line is $y = -2x - 2$.

b.



Because the line crosses the y-axis at $(0, 1)$, the y-intercept is 1. So, an equation of the line is $y = \frac{1}{3}x + 1$.

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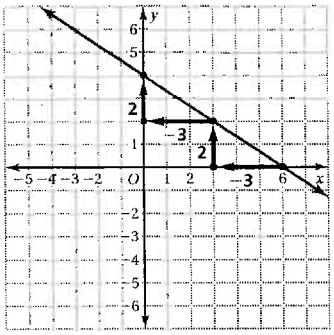
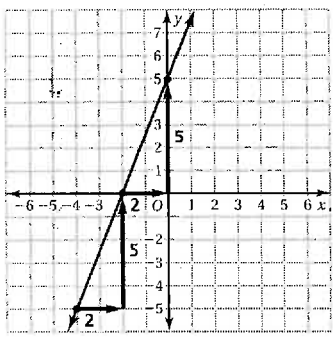
c.



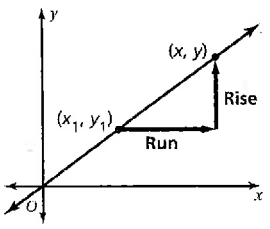
Because the line crosses the y-axis at $(0, 4)$, the y-intercept is 4. So, an equation of the line is $y = -\frac{2}{3}x + 4$.

d.



Because the line crosses the y-axis at $(0, 5)$, the y-intercept is 5. So, an equation of the line is $y = \frac{5}{2}x + 5$.

2. a–c.



d. The rise is the change in y, or the difference in the y-coordinates. The run is the change in x, or the difference in the x-coordinates.

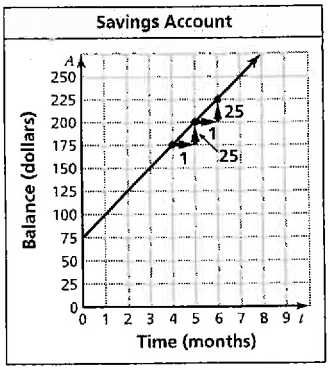
e. $m = \frac{y - y_1}{x - x_1}$

f. $(x - x_1)m = \frac{y - y_1}{x - x_1}(x - x_1)$

$(x - x_1)m = y - y_1$

This result represents the equation of a line with a slope of m that passes through the point (x_1, y_1).

3.



The slope is 25 because that is the increase each month. The point $(4, 175)$ represents your current savings after 4 months.

$A - A_1 = m(t - t_1)$

$A - 175 = 25(t - 4)$

$A - 175 = 25t - 100$

$A = 25t + 75$

An equation is $A = 25t + 75$.

4. a. $y - y_1 = m(x - x_1)$

$y - 6 = -2[x - (-4)]$

$y - 6 = -2(x + 4)$

$y - 6 = -2x - 8$

$y = -2x - 2$

b. $y - y_1 = m(x - x_1)$

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

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

$y = \frac{1}{3}x + 1$

c. $y - y_1 = m(x - x_1)$

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

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

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

d. $y - y_1 = m(x - x_1)$

$y - 0 = \frac{5}{2}[x - (-2)]$

$y - 0 = \frac{5}{2}(x + 2)$

$y = \frac{5}{2}x + 5$

The results are the same. The equation in Activity 2 can be used to write equations in slope-intercept form.

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Chapter 13

5. It is called the *point-slope form* of the equation of a line because you use the slope and a point on the line to write the equation of the line. It is important because it is a quick way to find the equation of a line.

6. Use the point-slope form of the equation of a line, $y - y_1 = m(x - x_1)$. Substitute the slope for m and the point for (x_1, y_1).

Sample answer: Write an equation of the line that passes through the point $(2, -1)$ with slope -2.

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - (-1) &= -2(x - 2) \\ y + 1 &= -2(x - 2) \\ y + 1 &= -2x + 4 \\ y &= -2x + 3 \end{aligned}$$

So, the equation is $y = -2x + 3$.

13.7 On Your Own (pp. 610–611)

1. $y - y_1 = m(x - x_1)$

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

So, the equation is $y - 2 = -4(x - 1)$.

2. $y - y_1 = m(x - x_1)$

$y - 0 = 1(x - 7)$

So, the equation is $y - 0 = 1(x - 7)$.

3. $y - y_1 = m(x - x_1)$

$$y - (-5) = -\frac{3}{4}[x - (-8)]$$

$$y + 5 = -\frac{3}{4}(x + 8)$$

So, the equation is $y + 5 = -\frac{3}{4}(x + 8)$.

4. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - 1}{3 - (-2)} = \frac{-5}{5} = -1$

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 1 &= -1[x - (-2)] \\ y - 1 &= -1(x + 2) \\ y - 1 &= -x - 2 \\ y &= -x - 1 \end{aligned}$$

So, the equation is $y = -x - 1$.

5. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - (-5)}{-3 - (-5)} = \frac{8}{2} = 4$

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 3 &= 4[x - (-3)] \\ y - 3 &= 4(x + 3) \\ y - 3 &= 4x + 12 \\ y &= 4x + 15 \end{aligned}$$

So, the equation is $y = 4x + 15$.

6. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{9 - 6}{-2 - (-8)} = \frac{3}{6} = \frac{1}{2}$

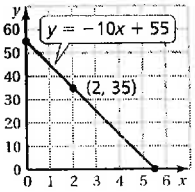
$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 6 &= \frac{1}{2}[x - (-8)] \\ y - 6 &= \frac{1}{2}(x + 8) \\ y - 6 &= \frac{1}{2}x + 4 \\ y &= \frac{1}{2}x + 10 \end{aligned}$$

So, the equation is $y = \frac{1}{2}x + 10$.

7. $y - y_1 = m(x - x_1)$

$$\begin{aligned} y - 35 &= -10(x - 2) \\ y - 35 &= -10x + 20 \\ y &= -10x + 55 \end{aligned}$$

So, the equation is $y = -10x + 55$.



13.7 Exercises (pp. 612–613)

Vocabulary and Concept Check

1. The slope is -2, and $(-1, 3)$ is a point on the line.

2. a. To write an equation of a line using its slope and a point on the line, write the point-slope form. Substitute the slope for m and the point for (x_1, y_1). Simplify and check your work.

b. To write an equation of a line using two points on the line, first use the two points to find the slope. Then write the point-slope form. Substitute the slope for m and one of the points for (x_1, y_1). Simplify and check your work.

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Chapter 13

Practice and Problem Solving

3. $y - y_1 = m(x - x_1)$

$y - 0 = \frac{1}{2}[x - (-2)]$

$y - 0 = \frac{1}{2}(x + 2)$

So, the equation is $y - 0 = \frac{1}{2}(x + 2)$.

4. $y - y_1 = m(x - x_1)$

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

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

So, the equation is $y - 3 = -\frac{3}{4}(x + 4)$.

5. $y - y_1 = m(x - x_1)$

$y - (-1) = -3(x - 3)$

$y + 1 = -3(x - 3)$

So, the equation is $y + 1 = -3(x - 3)$.

6. $y - y_1 = m(x - x_1)$

$y - 0 = -\frac{2}{3}(x - 3)$

So, the equation is $y - 0 = -\frac{2}{3}(x - 3)$.

7. $y - y_1 = m(x - x_1)$

$y - 8 = \frac{3}{4}(x - 4)$

So, the equation is $y - 8 = \frac{3}{4}(x - 4)$.

8. $y - y_1 = m(x - x_1)$

$y - (-3) = 4(x - 1)$

$y + 3 = 4(x - 1)$

So, the equation is $y + 3 = 4(x - 1)$.

9. $y - y_1 = m(x - x_1)$

$y - (-5) = -\frac{1}{7}(x - 7)$

$y + 5 = -\frac{1}{7}(x - 7)$

So, the equation is $y + 5 = -\frac{1}{7}(x - 7)$.

10. $y - y_1 = m(x - x_1)$

$y - 3 = \frac{5}{3}(x - 3)$

So, the equation is $y - 3 = \frac{5}{3}(x - 3)$.

11. $y - y_1 = m(x - x_1)$

$y - (-4) = -2[x - (-1)]$

$y + 4 = -2(x + 1)$

So, the equation is $y + 4 = -2(x + 1)$.

12. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - (-1)}{1 - (-1)} = \frac{6}{2} = 3$

$y - y_1 = m(x - x_1)$

$y - 5 = 3(x - 1)$

$y - 5 = 3x - 3$

$y = 3x + 2$

So, the equation is $y = 3x + 2$.

13. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 4}{3 - 2} = \frac{2}{1} = 2$

$y - y_1 = m(x - x_1)$

$y - 4 = 2(x - 2)$

$y - 4 = 2x - 4$

$y = 2x$

So, the equation is $y = 2x$.

14. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 3}{2 - (-2)} = \frac{4}{4} = 1$

$y - y_1 = m(x - x_1)$

$y - 7 = 1(x - 2)$

$y - 7 = x - 2$

$y = x + 5$

So, the equation is $y = x + 5$.

15. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 1}{8 - 4} = \frac{1}{4}$

$y - y_1 = m(x - x_1)$

$y - 1 = \frac{1}{4}(x - 4)$

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

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

So, the equation is $y = \frac{1}{4}x$.

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Chapter 13

16. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 5}{-3 - (-9)} = \frac{-2}{6} = -\frac{1}{3}$

$y - y_1 = m(x - x_1)$

$y - 5 = -\frac{1}{3}[x - (-9)]$

$y - 5 = -\frac{1}{3}(x + 9)$

$y - 5 = -\frac{1}{3}x - 3$

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

So, the equation is $y = -\frac{1}{3}x + 2$.

17. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 2}{-2 - 1} = \frac{-3}{-3} = 1$

$y - y_1 = m(x - x_1)$

$y - 2 = 1(x - 1)$

$y - 2 = x - 1$

$y = x + 1$

So, the equation is $y = x + 1$.

18. For each degree the temperature increases, the volume of the gas increases by $\frac{2}{25}$. So, the slope is $\frac{2}{25}$. At 0°C, the volume is 22 liters. So, the line passes through $(0, 22)$ and the V-intercept is 22. So, the equation is $V = \frac{2}{25}T + 22$.

19. a. The value decreases \$4000 each year. So, the slope is −4000. After 3 years, the value is \$18,000. So, the line passes through $(3, 18{,}000)$.

$V - V_1 = m(x - x_1)$

$V - 18{,}000 = -4000(x - 3)$

$V - 18{,}000 = -4000x + 12{,}000$

$V = -4000x + 30{,}000$

So, the equation is $V = -4000x + 30{,}000$.

b. The original value of the car is represented by the V-intercept. So, the original value was \$30,000.

20. a. The slope of the line parallel to $y = 4x - 3$ is 4.

$y - y_1 = m(x - x_1)$

$y - 2 = 4(x - 8)$

$y - 2 = 4x - 32$

$y = 4x - 30$

So, the equation of the parallel line is $y = 4x - 30$.

b. The slope of the line perpendicular to $y = 4x - 3$ is $-\frac{1}{4}$.

$y - y_1 = m(x - x_1)$

$y - 2 = -\frac{1}{4}(x - 8)$

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

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

So, the equation of the perpendicular line is $y = -\frac{1}{4}x + 4$.

21. a. Let x be the chirps per minute and let T be the temperature (°F). For each rise in temperature of 0.25°F, the cricket makes an additional chirp each minute. So, the slope is 0.25. A cricket chirps 40 times per minute when the temperature is 50°F. So, the line passes through $(40, 50)$.

$T - T_1 = m(x - x_1)$

$T - 50 = 0.25(x - 40)$

$T - 50 = 0.25x - 10$

$T = 0.25x + 40$

So, the equation is $T = 0.25x + 40$.

b. $T = 0.25x + 40$

$= 0.25(100) + 40$

$= 25 + 40$

$= 65$

The temperature is 65°F.

c. $T = 0.25x + 40$

$96 = 0.25x + 40$

$56 = 0.25x$

$224 = x$

You would expect the cricket to make 224 chirps in 1 minute.

22. a. After 5 seconds, the can contains 58 ounces and after 20 seconds, the can contains 28 ounces. So, the line passes through $(5, 58)$ and $(20, 28)$.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{28 - 58}{20 - 5} = \frac{-30}{15} = -2$

$y - y_1 = m(x - x_1)$

$y - 58 = -2(x - 5)$

$y - 58 = -2x + 10$

$y = -2x + 68$

So, the equation is $y = -2x + 68$.

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b. The y-intercept represents the amount of water in the watering can when you started watering. So, the watering can had 68 ounces of water.

c. The watering can is empty when $y = 0$.

$$y = -2x + 68$$
$$0 = -2x + 68$$
$$-68 = -2x$$
$$34 = x$$

The watering can is empty after 34 seconds.

23. a. A second point on the line is $(7.75, 0)$.

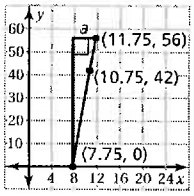
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{42 - 0}{10.75 - 7.75} = \frac{42}{3} = 14$$

$$y - y_1 = m(x - x_1)$$
$$y - 0 = 14(x - 7.75)$$
$$y = 14x - 108.5$$

So, the equation is $y = 14x - 108.5$.

b.
$$y = 14x - 108.5$$
$$56 = 14x - 108.5$$
$$164.5 = 14x$$
$$11.75 = x$$

So, the horizontal distance to the center of the top of the tower is 11.75 meters.



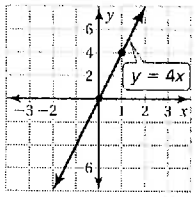
If the tower was originally vertical, its center was at $x = 7.75$. So, the top of the tower is $a = 11.75 - 7.75 = 4$ meters off center.

Fair Game Review

24. The slope is 4, and the y-intercept is 0. Plot $(0, 0)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{4}{1}$$

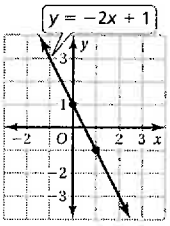
Plot the point that is 1 unit right and 4 units up from $(0, 0)$. Draw a line through the two points.



25. The slope is -2, and the y-intercept is 1. Plot $(0, 1)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{-2}{1}$$

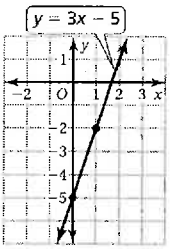
Plot the point that is 1 unit right and 2 units down from $(0, 1)$. Draw a line through the two points.



26. The slope is 3, and the y-intercept is -5. Plot $(0,-5)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{3}{1}$$

Plot the point that is 1 unit right and 3 units up from $(0, -5)$. Draw a line through the two points.



27. D; $3x + 5y = 30$
$$3x + 5(0) = 30$$
$$3x = 30$$
$$x = 10$$

The x-intercept is 10.

Quiz 13.4–13.7

1. $y = \frac{1}{4}x - 8$

$$y = \frac{1}{4}x + (-8)$$

The slope is $\frac{1}{4}$, and the y-intercept is -8.

2. $y = -x + 3$

The slope is -1, and the y-intercept is 3.

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Chapter 13

3. $3x - 2y = 12$

$3x - 2(0) = 12$

$3x = 12$

$x = 4$

The x-intercept is 4.

$3x - 2y = 12$

$3(0) - 2y = 12$

$-2y = 12$

$y = -6$

The y-intercept is -6.

4. $x + 5y = 15$

$x + 5(0) = 15$

$x = 15$

The x-intercept is 15.

$x + 5y = 15$

$0 + 5y = 15$

$5y = 15$

$y = 3$

The y-intercept is 3.

5. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 3}{0 - (-3)} = \frac{-4}{3} = -\frac{4}{3}$

Because the line crosses the y-axis at $(0, -1)$, the y-intercept is -1. So, the equation is $y = -\frac{4}{3}x - 1$.

6. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 0}{3 - 0} = \frac{3}{3} = 1$

Because the line crosses the y-axis at $(0, 0)$, the y-intercept is 0. So, the equation is $y = x$.

7. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - (-2)}{2 - 0} = \frac{1}{2}$

Because the line crosses the y-axis at $(0, -2)$, the y-intercept is -2. So, the equation is $y = \frac{1}{2}x - 2$.

8. $y - y_1 = m(x - x_1)$

$y - 3 = 2(x - 1)$

So, the equation is $y - 3 = 2(x - 1)$.

9. $y - y_1 = m(x - x_1)$

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

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

So, the equation is $y + 2 = \frac{1}{3}(x + 3)$.

10. $y - y_1 = m(x - x_1)$

$y - 4 = -1[x - (-1)]$

$y - 4 = -1(x + 1)$

So, the equation is $y - 4 = -1(x + 1)$.

11. $y - y_1 = m(x - x_1)$

$y - (-5) = -\frac{1}{8}(x - 8)$

$y + 5 = -\frac{1}{8}(x - 8)$

So, the equation is $y + 5 = -\frac{1}{8}(x - 8)$.

12. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-\frac{2}{3} - \left(-\frac{2}{3}\right)}{-3 - 0} = \frac{0}{-3} = 0$

$y - y_1 = m(x - x_1)$

$y - \left(-\frac{2}{3}\right) = 0(x - 0)$

$y + \frac{2}{3} = 0$

$y = -\frac{2}{3}$

So, the equation is $y = -\frac{2}{3}$.

13. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 0}{0 - 4} = \frac{4}{-4} = -1$

$y - y_1 = m(x - x_1)$

$y - 0 = -1(x - 4)$

$y = -x + 4$

So, the equation is $y = -x + 4$.

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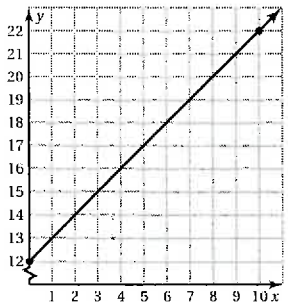
Chapter 13

14. a.



b. The y-intercept represents the admission price of \$12. The slope represents the unit cost of \$1 per ride.

15. a. $18x + 15y = 90$

$18x + 15(0) = 90$

$18x = 90$

$x = 5$

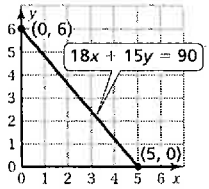
The x-intercept is 5.

$18x + 15y = 90$

$18(0) + 15y = 90$

$15y = 90$

$y = 6$



The y-intercept is 6.

b. The x-intercept shows that you can buy 5 gallons of blue paint if you do not buy any white paint. The y-intercept shows that you can buy 6 gallons of white paint if you do not buy any blue paint.

16. $\text{Length} = \frac{\text{Miles}}{\text{per week}} \cdot \frac{\text{Number}}{\text{of weeks}} + \frac{\text{Current}}{\text{length}}$

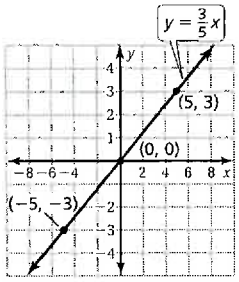
Let y be the length and let x be the number of weeks.

The equation is $y = \frac{1}{2}x + 13$.

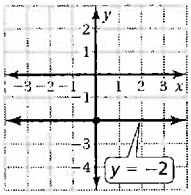
Chapter 13 Review

1.

x	$y = \frac{3}{5}x$	y	(x, y)
-5	$y = \frac{3}{5}(-5)$	-3	$(-5, -3)$
0	$y = \frac{3}{5}(0)$	0	$(0, 0)$
5	$y = \frac{3}{5}(5)$	3	$(5, 3)$

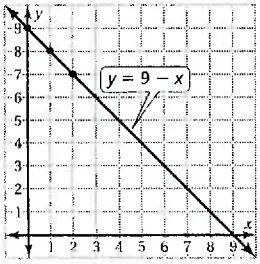


2. The graph of $y = -2$ is a horizontal line passing through $(0, -2)$.



3.

x	$y = 9 - x$	y	(x, y)
0	$y = 9 - 0$	9	$(0, 9)$
1	$y = 9 - 1$	8	$(1, 8)$
2	$y = 9 - 2$	7	$(2, 7)$



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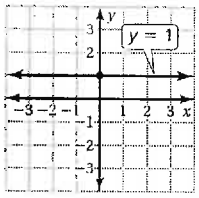
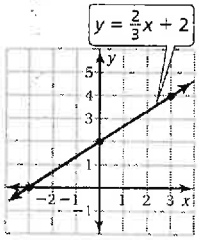
Chapter 13

4. The graph of $y = 1$ is a horizontal line passing through $(0, 1)$.

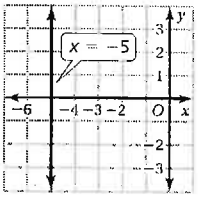


5.

x	$y = \frac{2}{3}x + 2$	y	(x, y)
-3	$y = \frac{2}{3}(-3) + 2$	0	$(-3, 0)$
0	$y = \frac{2}{3}(0) + 2$	2	$(0, 2)$
3	$y = \frac{2}{3}(3) + 2$	4	$(3, 4)$



6. The graph of $x = -5$ is a vertical line passing through $(-5, 0)$.



7. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 0}{2 - 1} = \frac{1}{1} = 1$

The slope is 1.

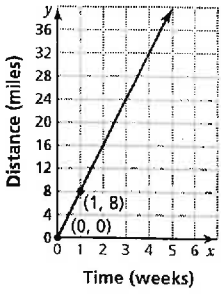
8. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 4}{2 - 0} = \frac{1}{2}$

The slope is $\frac{1}{2}$.

9. The lines are not parallel because $x = 2$ is a vertical line and $y = 4$ is a horizontal line.

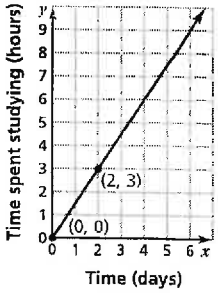
The lines are perpendicular because $x = 2$ is a vertical line and $y = 4$ is a horizontal line.

10.



The slope indicates that you run 8 miles per week.

11.

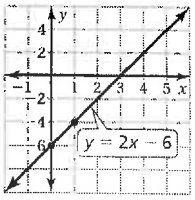


The slope indicates that you study 1.5 hours a day.

12. For the equation $y = 2x - 6$, the slope is 2 and the y-intercept is -6. Plot $(0, -6)$. Use the slope to find another point on the line.

$m = \frac{\text{rise}}{\text{run}} = \frac{2}{1}$

Plot the point that is 1 unit right and 2 units up from $(0, -6)$. Draw a line through the two points.



The line crosses the x-axis at $(3, 0)$. So, the x-intercept is 3.

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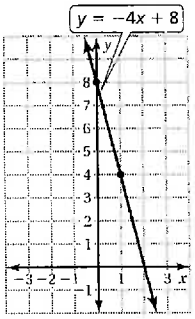
Chapter 13

13. For the equation $y = -4x + 8$, the slope is -4 and the y-intercept is 8. Plot $(0, 8)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{-4}{1}$$

Plot the point that is 1 unit right and 4 units down from $(0, 8)$. Draw a line through the two points.

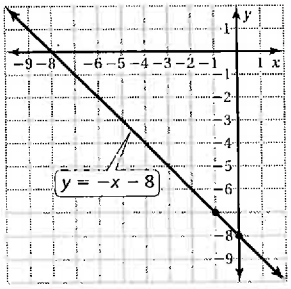


The line crosses the x-axis at $(2, 0)$. So, the x-intercept is 2.

14. For the equation $y = -x - 8$, the slope is -1 and the y-intercept is -8. Plot $(0, -8)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{1}{-1}$$

Plot the point that is 1 unit left and 1 unit up from $(0, -8)$. Draw a line through the two points.



The line crosses the x-axis at $(-8, 0)$. So, the x-intercept is -8.

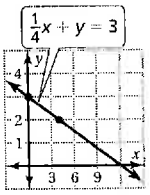
15. $\frac{1}{4}x + y = 3$

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

The slope is $-\frac{1}{4}$, and the y-intercept is 3. Plot $(0, 3)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{-1}{4}$$

Plot the point that is 4 units right and 1 unit down from $(0, 3)$. Draw a line through the points.



16. $-4x + 2y = 8$

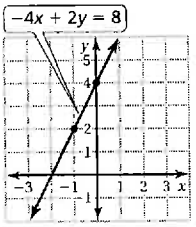
$$2y = 4x + 8$$

$$y = 2x + 4$$

The slope is 2, and the y-intercept is 4. Plot $(0, 4)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{2}{1} = \frac{-2}{-1}$$

Plot the point that is 1 unit left and 2 units down from $(0, 4)$. Draw a line through the points.



17. $x + 5y = 10$

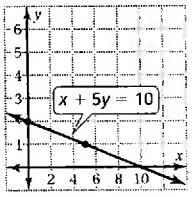
$$5y = -x + 10$$

$$y = -\frac{1}{5}x + 2$$

The slope is $-\frac{1}{5}$, and the y-intercept is 2. Plot $(0, 2)$. Use the slope to find another point on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{-1}{5}$$

Plot the point that is 5 units right and 1 unit down from $(0, 2)$. Draw a line through the points.



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Chapter 13

18. $-\frac{1}{2}x + \frac{1}{8}y = \frac{3}{4}$

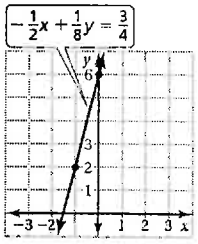
$\frac{1}{8}y = \frac{1}{2}x + \frac{3}{4}$

$y = 4x + 6$

The slope is 4, and the y-intercept is 6. Plot $(0, 6)$. Use the slope to find another point on the line.

$m = \frac{\text{rise}}{\text{run}} = \frac{4}{1} = \frac{-4}{-1}$

Plot the point that is 1 unit left and 4 units down from $(0, 6)$. Draw a line through the points.



19. $30x + 6y = 180$

$30x + 6(0) = 180$

$30x = 180$

$x = 6$

The x-intercept is 6. It shows that you can board your dog for 6 nights when there are no hours of playtime.

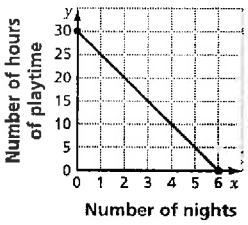
$30x + 6y = 180$

$30(0) + 6y = 180$

$6y = 180$

$y = 30$

The y-intercept is 30. It shows that you can have 30 hours of playtime for your dog when you do not leave your dog at the kennel for any nights.



20. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-2)}{3 - 0} = \frac{3}{3} = 1$

Because the line crosses the y-axis at $(0, -2)$, the y-intercept is -2. So, the equation is $y = x - 2$.

21. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 4}{4 - 0} = \frac{-2}{4} = -\frac{1}{2}$

Because the line crosses the y-axis at $(0, 4)$, the y-intercept is 4. So, the equation is $y = -\frac{1}{2}x + 4$.

22. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 1}{2 - 0} = \frac{-4}{2} = -2$

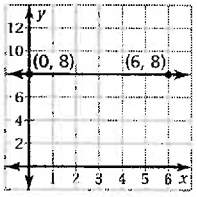
Because the line crosses the y-axis at $(0, 1)$, the y-intercept is 1. So, the equation is $y = -2x + 1$.

23. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-3)}{2 - 0} = \frac{4}{2} = 2$

Because the line crosses the y-axis at $(0, -3)$, the y-intercept is -3. So, the equation is $y = 2x - 3$.

24. The line is horizontal, so the change in y is 0.

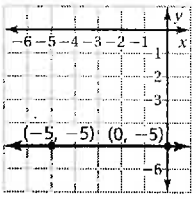
$m = \frac{\text{change in } y}{\text{change in } x} = \frac{0}{6} = 0$



Because the line crosses the y-axis at $(0, 8)$, the y-intercept is 8. So, the equation is $y = 0x + 8$, or $y = 8$.

25. The line is horizontal, so the change in y is 0.

$m = \frac{\text{change in } y}{\text{change in } x} = \frac{0}{5} = 0$



Because the line crosses the y-axis at $(0, -5)$, the y-intercept is -5. So, the equation is $y = 0x + (-5)$, or $y = -5$.

26. $y - y_1 = m(x - x_1)$

$y - 4 = 3(x - 4)$

So, the equation is $y - 4 = 3(x - 4)$.

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27. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 2}{6 - (-4)} = \frac{-5}{10} = -\frac{1}{2}$

$y - y_1 = m(x - x_1)$

$y - 2 = -\frac{1}{2}[x - (-4)]$

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

$y - 2 = -\frac{1}{2}x - 2$

$y = -\frac{1}{2}x$

So, the equation is $y = -\frac{1}{2}x$.

Chapter 13 Test

1. $y = 6x - 5$

$y = 6x + (-5)$

The slope is 6, and the y-intercept is -5.

2. $y = 20x + 15$

The slope is 20, and the y-intercept is 15.

3. $y = -5x - 16$

$y = -5x + (-16)$

The slope is -5, and the y-intercept is -16.

4. $y - 1 = 3x + 8.4$

$y = 3x + 9.4$

The slope is 3, and y-intercept is 9.4.

5. $y + 4.3 = 0.1x$

$y = 0.1x - 4.3$

$y = 0.1x + (-4.3)$

The slope is 0.1, and the y-intercept is -4.3.

6. $-\frac{1}{2}x + 2y = 7$

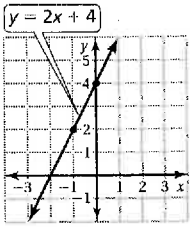
$2y = \frac{1}{2}x + 7$

$y = \frac{1}{4}x + \frac{7}{2}$

The slope is $\frac{1}{4}$, and the y-intercept is $\frac{7}{2}$.

7.

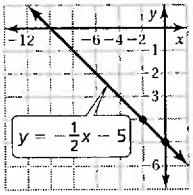
x	$y = 2x + 4$	y	(x, y)
-1	$y = 2(-1) + 4$	2	$(-1, 2)$
0	$y = 2(0) + 4$	4	$(0, 4)$



8. For the equation $y = -\frac{1}{2}x - 5$, the slope is $-\frac{1}{2}$ and the y-intercept is -5. Plot $(0, -5)$. Use the slope to find another point on the line.

$m = \frac{\text{rise}}{\text{run}} = \frac{1}{-2}$

Plot the point that is 2 units left and 1 unit up from $(0, -5)$. Draw a line through the two points.



9. $-3x + 6y = 12$

$-3x + 6(0) = 12$

$-3x = 12$

$x = -4$

The x-intercept is -4.

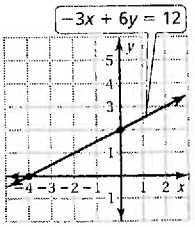
$-3x + 6y = 12$

$-3(0) + 6y = 12$

$6y = 12$

$y = 2$

The y-intercept is 2.



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