

3.5

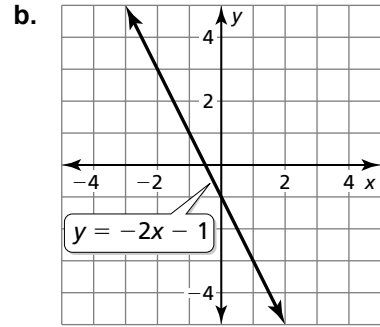
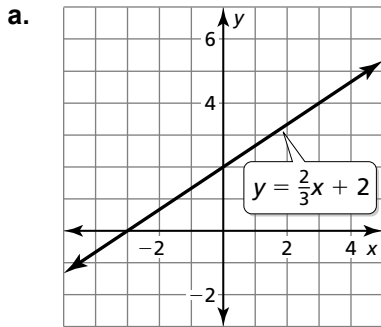
Graphing Linear Equations in Slope-Intercept Form

For use with Exploration 3.5

Essential Question How can you describe the graph of the equation $y = mx + b$?

1 EXPLORATION: Finding Slopes and y-Intercepts

Work with a partner. Find the slope and y-intercept of each line.

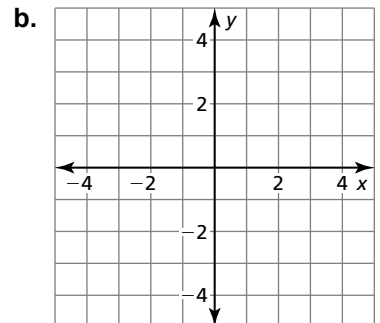
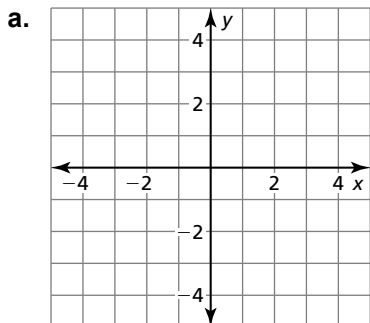


2 EXPLORATION: Writing a Conjecture

Go to BigIdeasMath.com for an interactive tool to investigate this exploration.

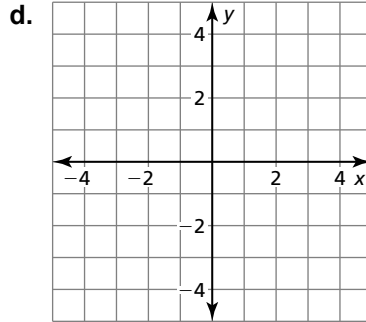
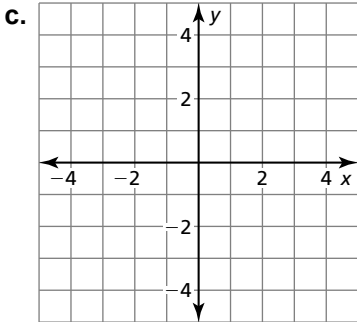
Work with a partner. Graph each equation. Then complete the table. Use the completed table to write a conjecture about the relationship between the graph of $y = mx + b$ and the values of m and b .

Equation	Description of graph	Slope of graph	y-Intercept
a. $y = -\frac{2}{3}x + 3$	Line	$-\frac{2}{3}$	3
b. $y = 2x - 2$			
c. $y = -x + 1$			
d. $y = x - 4$			



3.5 Graphing Linear Equation in Slope-Intercept Form (continued)

2 EXPLORATION: Writing a Conjecture (continued)



Communicate Your Answer

3. How can you describe the graph of the equation $y = mx + b$?
 - a. How does the value of m affect the graph of the equation?
 - b. How does the value of b affect the graph of the equation?
 - c. Check your answers to parts (a) and (b) by choosing one equation from Exploration 2 and (1) varying only m and (2) varying only b .

3.5

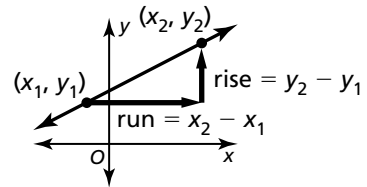
Practice

For use after Lesson 3.5

Core Concepts

Slope

The **slope** m of a nonvertical line passing through two points (x_1, y_1) and (x_2, y_2) is the ratio of the **rise** (change in y) to the **run** (change in x).



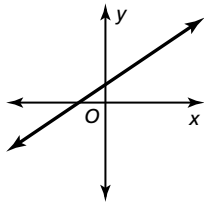
$$\text{slope} = m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$

When the line rises from left to right, the slope is positive. When the line falls from left to right, the slope is negative.

Notes:

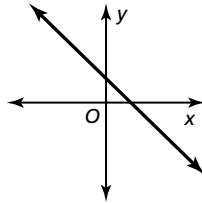
Slope

Positive slope



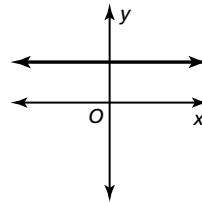
The line rises from left to right.

Negative slope



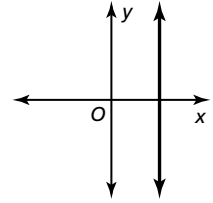
The line falls from left to right.

Slope of 0



The line is horizontal.

Undefined slope



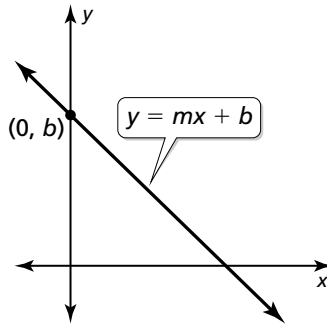
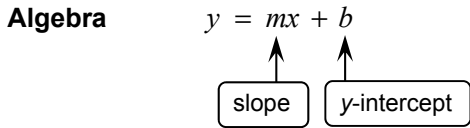
The line is vertical.

Notes:

3.5 Practice (continued)

Slope-Intercept Form

Words A linear equation written in the form $y = mx + b$ is in **slope-intercept form**.
 The slope of the line is m , and the y -intercept of the line is b .



Notes:

Worked-Out Examples

Example #1

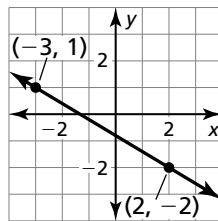
Describe the slope of the line. Then find the slope.

The line falls from left to right. So, the slope is negative.

Let $(x_1, y_1) = (-3, 1)$ and $(x_2, y_2) = (2, -2)$.

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

The slope is $-\frac{3}{5}$.



Example #2

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

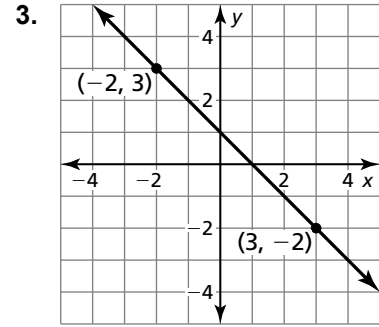
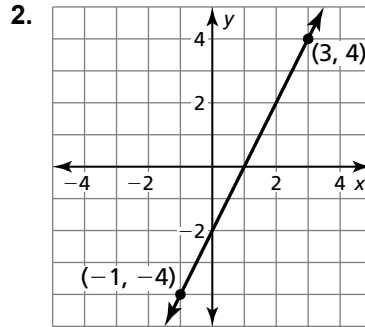
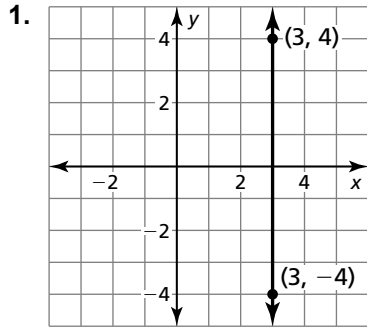
$$\begin{aligned} -5x &= 8 - y \\ \underline{+ y} \quad \underline{+ y} \\ -5x + y &= 8 \\ \underline{+ 5x} \quad \underline{+ 5x} \\ y &= 5x + 8 \end{aligned}$$

The slope is 5 and the y -intercept is 8.

3.5 Practice (continued)

Practice A

In Exercise 1–3, describe the slope of the line. Then find the slope.



In Exercise 4 and 5, the points represented by the table lie on a line. Find the slope of the line.

4.

x	1	2	3	4
y	-2	-2	-2	-2

5.

x	-3	-1	1	3
y	11	3	-5	-13

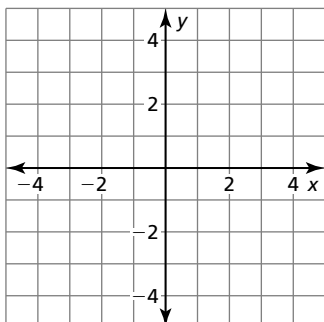
In Exercise 6–8, find the slope and the y -intercept of the graph of the linear equation.

6. $6x + 4y = 24$

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

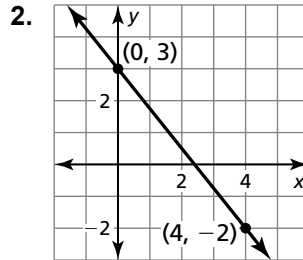
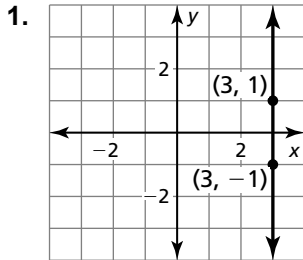
8. $y = 5x$

9. A linear function f models a relationship in which the dependent variable decreases 6 units for every 3 units the independent variable decreases. The value of the function at 0 is 4. Graph the function. Identify the slope, y -intercept, and x -intercept of the graph.



Practice B

In Exercises 1 and 2, describe the slope of the line. Then find the slope.



In Exercises 3 and 4, the points represented by the table lie on a line. Find the slope of the line.

3.

x	4	4	4	4
y	-2	1	4	7

4.

x	3	1	-1	-3
y	-4	1	6	11

In Exercises 5–8, find the slope and the y -intercept of the graph of the linear equation.

5. $y = 12$

6. $-3x + y = 7$

7. $-4x = 9 - 2y$

8. $0 = 2 - 3y + 12x$

In Exercises 9–12, graph the linear equation. Identify the x -intercept.

9. $y = x$

10. $x + 3y = 9$

11. $-y + 2x = 0$

12. $3x - y + 1 = 0$

13. A linear function g models the growth of your hair. On average, the length of a hair strand increases 1.25 centimeters every month.

a. Graph g when $g(0) = 10$.

b. Identify the slope and interpret the y -intercept of the graph.

c. By how much, in inches, does the length of a hair strand increase each month?

In Exercises 14 and 15, find the value of k so that the graph of the equation has the given slope or y -intercept.

14. $y = 6kx - 2; m = \frac{2}{3}$

15. $y = -\frac{1}{2}x + \frac{4}{3}k; b = -8$