LESSON 3.5
NOTES

GOAL
Graph linear equations using slope-intercept form.

Vocabulary
A linear equation of the form $y = mx + b$ is written in **slope-intercept form**, where m is the slope and b is the y-intercept of the equation's graph.
Two lines in the same plane are **parallel** if they do not intersect.

Key Concept
The slope-intercept form of a linear equation is $y = mx + b$ where m is the slope and b is the y-intercept
of the graph of the equation. You can use the slope-intercept form to find two points on the graph by first
plotting the point that corresponds to the y-intercept and then using the slope to locate a second point.

Common Student Errors
• Misinterpreting the y-intercept when it is negative

  Tip Recall the slope-intercept form $y = mx + b$.

Example: $2x + 3y = 29$

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

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

So, the y-intercept is 3. ✗

EXAMPLE 1

Identify the slope and y-intercept

Identify the slope and y-intercept of the line with the given equation.

   a. $y = \dfrac{1}{4}x - 2$

   b. $-2x + 3y = 9$

Solution

   a. The equation is in the form $y = mx + b$. So, the slope of the line is $\dfrac{1}{4}$, and the y-intercept is -2.

   b. Rewrite the equation in slope-intercept form by solving for y.

$$-2x + 3y = 9 \qquad\qquad \text{Write original equation.}$$
$$3y = 2x + 9 \qquad\qquad \text{Add } 2x \text{ to each side.}$$
$$y = \frac{2}{3}x + 3 \qquad\qquad \text{Divide each side by 3.}$$

The line has a slope of $\dfrac{2}{3}$ and a y-intercept of 3.

Exercises for Example 1

Identify the slope and y-intercept of the line with the given equation.

   1. $y = -3x + 7$

   2. $15x - 5y = 10$

   3. $-x - 6y = 18$

EXAMPLE 2

Graph an equation using slope-intercept form
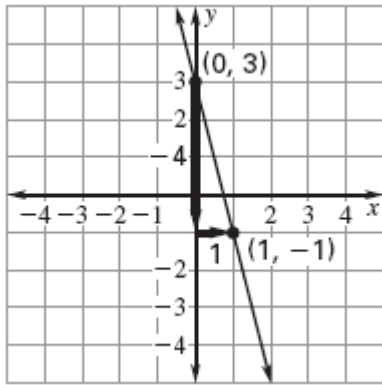
Graph the equation $4x + y = 3$

Solution

STEP 1 Rewrite the equation in slope-intercept form. $y = -4x + 3$

STEP 2 Identify the slope and the y-intercept. $m = -4$ and $b = 3$

STEP 3 Plot the point that corresponds to the y-intercept, (0, 3).

STEP 4 Use the slope to locate a second point on the line. Draw a line through the two points.

Exercises for Example 2

Graph the equation.

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

5. $. y = -x$

EXAMPLE 3
Identify parallel lines

Determine which of the lines are parallel: line *a* through (–3, 1) and (–6, 7); line *b* through (–7, –5) and (1, 11); line *c* through (2, 5) and (4, 9)

Solution
Find the slope of each line.

Line a: $m = \dfrac{7-1}{-6-(-3)} = \dfrac{6}{-3} = -2$

Line b: $m = \dfrac{11-(5)}{1-(-7)} = \dfrac{16}{8} = 2$

Line c: $m = \dfrac{9-5}{4-2} = \dfrac{4}{2} = 2$

Line *b* and line *c* have the same slope, so they are parallel.

Exercise for Example 3

6. Determine which of the lines are parallel: line *a* through (5, 3) and (8, 5); line *b* through (–2, 9) and (1, 11); line *c* through (12, 8) and (8, 2).

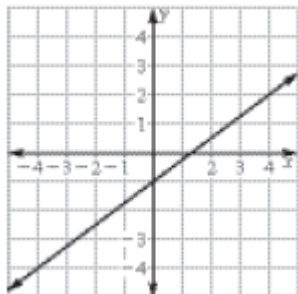*Answer Key*

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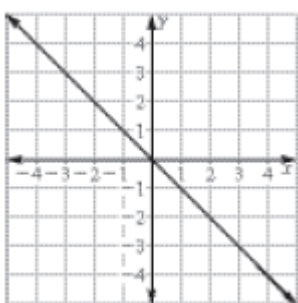**Study Guide**

1. $m = -3, b = 7$
2. $m = 3, b = -2$
3. $m = -\dfrac{1}{6}, b = -3$

4.

5.

6. $a \| b$