5.5 Write Equations of Parallel and Perpendicular Lines

Before	You used slope to determine whether lines are parallel.
Now	You will write equations of parallel and perpendicular lines.
Why?	So you can analyze growth rates, as in Ex. 33.

Key Vocabulary
- converse
- perpendicular lines
- conditional statement, *p. 66*

The **converse** of a conditional statement interchanges the hypothesis and conclusion. The converse of a true statement is not necessarily true.

In Chapter 4, you learned that the statement "If two nonvertical lines have the same slope, then they are parallel" is true. Its converse is also true.

KEY CONCEPT   *For Your Notebook*

Parallel Lines

- If two nonvertical lines in the same plane have the same slope, then they are parallel.

- If two nonvertical lines in the same plane are parallel, then they have the same slope.

EXAMPLE 1   Write an equation of a parallel line

Write an equation of the line that passes through $(-3, -5)$ and is parallel to the line $y = 3x - 1$.

Solution

STEP 1 **Identify** the slope. The graph of the given equation has a slope of 3. So, the parallel line through $(-3, -5)$ has a slope of 3.

STEP 2 **Find** the y-intercept. Use the slope and the given point.

$$y = mx + b \qquad \text{Write slope-intercept form.}$$

$$-5 = 3(-3) + b \qquad \text{Substitute 3 for } m, -3 \text{ for } x, \text{ and } -5 \text{ for } y.$$

$$4 = b \qquad \text{Solve for } b.$$

STEP 3 **Write** an equation. Use $y = mx + b$.

$$y = 3x + 4 \qquad \text{Substitute 3 for } m \text{ and 4 for } b.$$

CHECK REASONABLENESS
You can check that your answer is reasonable by graphing both lines.

✓ **GUIDED PRACTICE**   for Example 1

1. Write an equation of the line that passes through $(-2, 11)$ and is parallel to the line $y = -x + 5$.