Notes Chp. 4.4 STANDARD FORM

GOAL **Write equations in standard form.**

Key Concept

Write linear equations in standard form $Ax + By = C$.

Common Student Errors

- Students may not realize that equations of horizontal and vertical lines are written in standard form

  Tip Substitute 0 for A or B in the standard form to show that the equations are in standard form.

  The equation of the horizontal line $0x + 1y = -1$ simplifies to $y = -1$. The equation of the vertical line $1x + 0y = 2$ simplifies to $x = 2$.

- Thinking different forms of a linear equation represent different lines

  Tip Stress to students that the same line can be written in many different forms, such as slope-intercept form and standard form.

  Show many examples of linear equations written in different forms. Have students practice writing linear equations in different forms.

EXAMPLE 1 Write equivalent equations in standard form

Write two equations in standard form that are equivalent to $3x - 9y = 12$.

Solution

To write one equivalent equation, multiply each side by $\frac{1}{3}$.

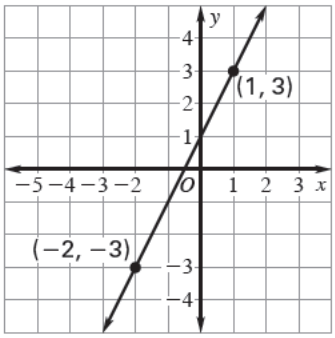
$x - 3y = 4$

To write another equivalent equation, multiply each side by 2.

$6x - 18y = 24$

EXAMPLE 2 Write an equation from a graph

Write an equation in standard form of the line shown.



Solution

STEP 1 **Calculate** the slope.

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

STEP 2 **Write** an equation in point-slope form. Use (1, 3).

$y - y_1 = m(x - x_1)$ Write point-slope form.

$y - 3 = 2(x - 1)$ Substitute 2 for m, 1 for x, and 3 for y.

STEP 3 **Rewrite** the equation in standard form.

$y - 3 = 2x - 2$ Distributive property

$-2x + y = 1$ Collect variable terms on one side, constants on the other.

Exercises for Examples 1 and 2

1. Write two equations in standard form that are equivalent to $6x + 2y = 8$.

Write an equation in standard form of the line that passes through the given points.

2. (4, 4), (8, 2)

3. (−2, 3), (−4, −5)

EXAMPLE 3 Write an equation of a line

Write equations of the horizontal and vertical lines that pass through the point (−2, 8).

Solution

The horizontal line has all the same y-coordinates. The y-coordinate of the given point is 8. So, an equation of the horizontal line is $y = 8$.

The vertical line has all the same x-coordinates. The x-coordinate of the given point is -2. So, an equation of the vertical line is $x = -2$.

Exercises for Example 3

Write equations of the horizontal and vertical lines that pass through the given point.

4. $(7, -2)$

5. $(-1, 5)$

EXAMPLE 4 Complete an equation in standard form

The graph of $5x + By = 6$ is a line that passes through the point (2, 1). Find the missing coefficient and write the completed equation.

Solution

STEP 1 **Find** the value of B. Substitute the coordinates of the given point for x and y in the equation. Solve for B.

$5x + By = 6$ Write equation.

$5(2) + B(1) = 6$ Substitute 2 for x and 1 for y.

$B = -4$ Simplify.

STEP 2 **Complete** the equation.

$5x - 4y = 6$ Substitute -4 for B.

The completed equation is $5x - 4y = 6$.

Exercises for Example 4

Find the missing coefficient in the equation of the line that passes through the given point. Write the completed equation.

6. $Ax + 5y = 7, (4, 3)$

7. $4x + By = 6, (3, -2)$