

## 8-4 The Slope-Intercept Form of a Linear Equation

**Objective:** To use the slope-intercept form of a linear equation.

### Vocabulary

**y-intercept** The y-coordinate of a point where a graph intersects the y-axis.

Since the point is on the y-axis, its x-coordinate is 0.

**Slope-intercept form of an equation** The equation of a line in the form

$y = mx + b$ , where  $m$  is the slope and  $b$  is the y-intercept.

**Parallel lines** Lines in the same plane that do not intersect. Lines with the same slope and different y-intercepts are parallel.

**Example 1** Find the slope and y-intercept of each line: a.  $y = \frac{5}{2}x + 4$  b.  $y = \frac{5}{2}x$  c.  $y = 4$

**Solution** Use the slope-intercept form,  $y = mx + b$ .

a.  $y = \frac{5}{2}x + 4$

$$y = \frac{5}{2}x + 4$$

$\uparrow$        $\uparrow$   
 $m$        $b$

The slope is  $\frac{5}{2}$  and  
the y-intercept is 4.

b.  $y = \frac{5}{2}x$

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

$\uparrow$        $\uparrow$   
 $m$        $b$

The slope is  $\frac{5}{2}$  and  
the y-intercept is 0.

c.  $y = 4$

$$y = 0x + 4$$

$\uparrow$        $\uparrow$   
 $m$        $b$

The slope is 0 and  
the y-intercept is 4.

**Find the slope and the y-intercept.**

1.  $y = x - 3$

2.  $y = 2x + 3$

3.  $y = -2$

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

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

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

7.  $y = -2x + 6$

8.  $y = -4x + 8$

9.  $y = -x + 5$

10.  $y = x - 9$

11.  $y = 3x - 2$

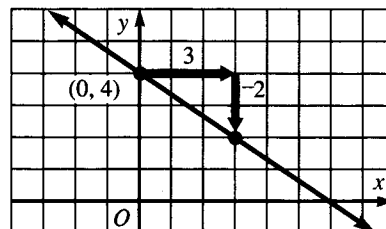
12.  $y = 3$

**Example 2** Use only the slope and y-intercept to graph  $y = -\frac{2}{3}x + 4$ .

**Solution** 1. Since the y-intercept is 4, plot (0, 4).

2. Since the slope  $m = -\frac{2}{3} = \frac{-2}{3} = \frac{\text{rise}}{\text{run}}$ ,  
move 3 units to the right of (0, 4) and  
2 units down to locate a second point.

3. Draw a line through the points.



**Use only the slope and y-intercept to graph each equation. You may wish to verify your graphs on a computer or a graphing calculator.**

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

14.  $y = \frac{3}{4}x - 3$

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

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

17.  $y = -x + 3$

18.  $y = 2x + 1$

19.  $y = -3$

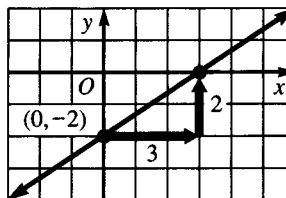
20.  $y = 5$

**8-4 The Slope-Intercept Form of a Linear Equation (continued)**

**Example 3** Use only the slope and y-intercept to graph  $2x - 3y = 6$ .

**Solution**  $2x - 3y = 6$       { Solve for y to transform the equation  
 $-3y = -2x + 6$       { into the form  $y = mx + b$ .  
 $y = \frac{2}{3}x - 2$

1. Since  $b = -2$ , plot  $(0, -2)$ .
2. Since  $m = \frac{2}{3}$ , move 3 units to the right and 2 units up to locate a second point.
3. Draw a line through the points.



Use only the slope and y-intercept to graph each equation. You may wish to verify your graphs on a computer or a graphing calculator.

21.  $2x + y = 4$       22.  $3x + y = 6$       23.  $2x - y = -6$       24.  $3x - y = 3$   
 25.  $x + 2y = -2$       26.  $2x - 3y = 6$       27.  $4x - 3y = 12$       28.  $x + 4y = 4$

**Example 4** Determine whether the lines with equations  $4x + 5y = 20$  and  $4x + 5y = 10$  are parallel.

**Solution** Write each equation in slope-intercept form:

$$\begin{array}{ll} 4x + 5y = 20 & 4x + 5y = 10 \\ 5y = -4x + 20 & 5y = -4x + 10 \\ y = -\frac{4}{5}x + 4 & y = -\frac{4}{5}x + 2 \\ \text{slope} = -\frac{4}{5} \text{ y-intercept} = 4 & \text{slope} = -\frac{4}{5} \text{ y-intercept} = 2 \end{array}$$

Since both lines have the same slope and different y-intercepts, they are parallel.

Determine whether the lines whose equations are given are parallel.

29.  $2x - y = 5$       30.  $x - 3y = 2$       31.  $2x - y = 6$   
 $2x - y = 8$        $-2x + 6y = 12$        $2y - x = 6$   
 32.  $3x - y = 2$       33.  $\frac{1}{2}x - \frac{1}{2}y = 4$       34.  $4x + \frac{1}{4}y = 2$   
 $-6x + 2y = 8$        $2x - 2y = 3$        $4x + 4y = 2$

**Mixed Review Exercises**

Find the slope of the line through each pair of given points.

1.  $(-2, 1), (-1, 2)$       2.  $(1, 2), (3, -2)$       3.  $(-3, 4), (-1, -2)$       4.  $(1, 5), (2, 8)$

Factor.

5.  $2x^2 + 7x + 6$       6.  $2x^2 - 4x + 2$       7.  $4y^2 - 25z^2$       8.  $m^2 - 3mn - 10n^2$