

# Study Guide and Intervention

Alg1 8.0

## Geometry: Parallel and Perpendicular Lines

**Parallel Lines** Two nonvertical lines are **parallel** if they have the same slope. All vertical lines are parallel.

**Example** Write the slope-intercept form for an equation of the line that passes through  $(-1, 6)$  and is parallel to the graph of  $y = 2x + 12$ .

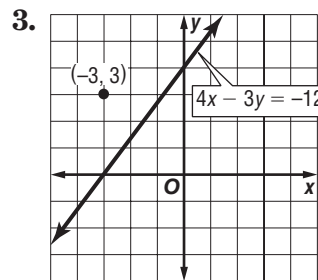
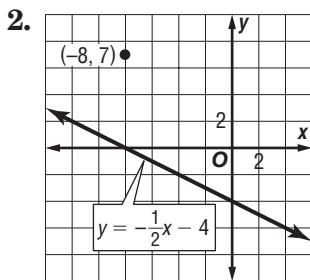
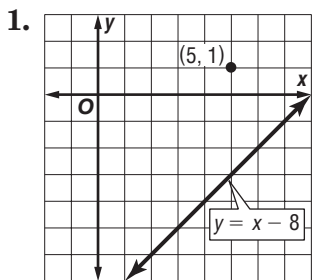
A line parallel to  $y = 2x + 12$  has the same slope, 2. Replace  $m$  with 2 and  $(x_1, y_1)$  with  $(-1, 6)$  in the point-slope form.

$$\begin{aligned}
 y - y_1 &= m(x - x_1) && \text{Point-slope form} \\
 y - 6 &= 2(x - (-1)) && m = 2; (x_1, y_1) = (-1, 6) \\
 y - 6 &= 2(x + 1) && \text{Simplify.} \\
 y - 6 &= 2x + 2 && \text{Distributive Property} \\
 y &= 2x + 8 && \text{Slope-intercept form}
 \end{aligned}$$

Therefore, the equation is  $y = 2x + 8$ .

### Exercises

Write the slope-intercept form for an equation of the line that passes through the given point and is parallel to the graph of each equation.



4.  $(-2, 2), y = 4x - 2$
5.  $(6, 4), y = \frac{1}{3}x + 1$
6.  $(4, -2), y = -2x + 3$
7.  $(-2, 4), y = -3x + 10$
8.  $(-1, 6), 3x + y = 12$
9.  $(4, -6), x + 2y = 5$
10. Find an equation of the line that has a  $y$ -intercept of 2 that is parallel to the graph of the line  $4x + 2y = 8$ .
11. Find an equation of the line that has a  $y$ -intercept of  $-1$  that is parallel to the graph of the line  $x - 3y = 6$ .
12. Find an equation of the line that has a  $y$ -intercept of  $-4$  that is parallel to the graph of the line  $y = 6$ .

**Study Guide and Intervention** *(continued)***Geometry: Parallel and Perpendicular Lines**

**Perpendicular Lines** Two non-vertical lines are **perpendicular** if their slopes are negative reciprocals of each other. Vertical and horizontal lines are perpendicular.

**Example** Write the slope-intercept form for an equation that passes through  $(-4, 2)$  and is perpendicular to the graph of  $2x - 3y = 9$ .

Find the slope of  $2x - 3y = 9$ .

$$\begin{aligned} 2x - 3y &= 9 && \text{Original equation} \\ -3y &= -2x + 9 && \text{Subtract } 2x \text{ from each side.} \\ y &= \frac{2}{3}x - 3 && \text{Divide each side by } -3. \end{aligned}$$

The slope of  $y = \frac{2}{3}x - 3$  is  $\frac{2}{3}$ . So, the slope of the line passing through  $(-4, 2)$  that is perpendicular to this line is the negative reciprocal of  $\frac{2}{3}$ , or  $-\frac{3}{2}$ .

Use the point-slope form to find the equation.

$$\begin{aligned} y - y_1 &= m(x - x_1) && \text{Point-slope form} \\ y - 2 &= -\frac{3}{2}(x - (-4)) && m = -\frac{3}{2}; (x_1, y_1) = (-4, 2) \\ y - 2 &= -\frac{3}{2}(x + 4) && \text{Simplify.} \\ y - 2 &= -\frac{3}{2}x - 6 && \text{Distributive Property} \\ y &= -\frac{3}{2}x - 4 && \text{Slope-intercept form} \end{aligned}$$

**Exercises**

Write the slope-intercept form for an equation of the line that passes through the given point and is perpendicular to the graph of each equation.

- $(4, 2), y = \frac{1}{2}x + 1$
- $(2, -3), y = -\frac{2}{3}x + 4$
- $(6, 4), y = 7x + 1$
- $(-8, -7), y = -x - 8$
- $(6, -2), y = -3x - 6$
- $(-5, -1), y = \frac{5}{2}x - 3$
- $(-9, -5), y = -3x - 1$
- $(-1, 3), 2x + 4y = 12$
- $(6, -6), 3x - y = 6$
- Find an equation of the line that has a  $y$ -intercept of  $-2$  and is perpendicular to the graph of the line  $x - 2y = 5$ .
- Find an equation of the line that has a  $y$ -intercept of  $5$  and is perpendicular to the graph of the line  $4x + 3y = 8$ .