NAME _____ DATE _____ PERIOD _____

4-4 Study Guide and Intervention

Parallel and Perpendicular Lines

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

Example **Write an equation in slope-intercept form for 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.

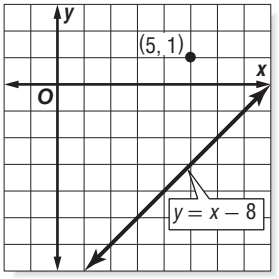
$y - y_1 = m(x - x_1)$	Point-slope form
$y - 6 = 2(x - (-1))$	$m = 2$; $(x_1, y_1) = (-1, 6)$
$y - 6 = 2(x + 1)$	Simplify.
$y - 6 = 2x + 2$	Distributive Property
$y = 2x + 8$	Slope-intercept form

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

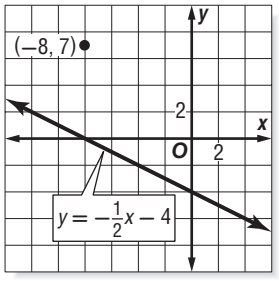
Exercises

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

1.



2.



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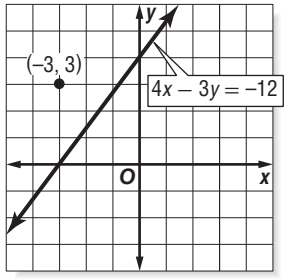

4. $(-2, 2)$, $y = 4x - 2$

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 $y = 6$.

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4-4 Study Guide and Intervention *(continued)*

Parallel and Perpendicular Lines

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

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

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

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

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.

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

Exercises

1. **ARCHITECTURE** On the architect's plans for a new high school, a wall represented by $\overline{MN}$ has endpoints $M(-3, -1)$ and $N(2, 1)$. A wall represented by $\overline{PQ}$ has endpoints $P(4, -4)$ and $Q(-2, 11)$. Are the walls perpendicular? Explain.

Determine whether the graphs of the following equations are *parallel* or *perpendicular*.

2. $2x + y = -7, x - 2y = -4, 4x - y = 5$

3. $y = 3x, 6x - 2y = 7, 3y = 9x - 1$

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

4. $(4, 2), y = \frac{1}{2}x + 1$

5. $(2, -3), y = -\frac{2}{3}x + 4$

6. $(6, 4), y = 7x + 1$

7. $(-8, -7), y = -x - 8$

8. $(6, -2), y = -3x - 6$

9. $(-5, -1), y = \frac{5}{2}x - 3$