5-6 Reteaching

Parallel and Perpendicular Lines

Nonvertical lines are parallel if they have the same slope and different *y*-intercepts. The graphs of $y = 2x - 6$ and $y = 2x + 3$ are parallel because they have the same slope, 2, but different *y*-intercepts, –6 and 3.

Problem

What is an equation in slope-intercept form of the line that passes through (8, 7) and is parallel to the graph of $y = \frac{3}{4}x + 2$?

The slope of $y = \frac{3}{4}x + 2$ is $\frac{3}{4}$. Because the desired equation is for a line parallel to a line with slope $\frac{3}{4}$, the slope of the parallel line must also be $\frac{3}{4}$. Use the slope and the given point in the point-slope form of a linear equation and then solve for *y* to write the equation in slope-intercept form.

$y - y_1 = m(x - x_1)$	Start with the point-slope form
$y - 7 = \frac{3}{4}(x - 8)$	Substitute (8, 7) for (x_1, y_1) and $\frac{3}{4}$ for *m*.
$y - 7 = \frac{3}{4}x - 6$	Distributive Property
$y = \frac{3}{4}x + 1$	Add 7 to each side.

The graph of $y = \frac{3}{4}x + 1$ passes through (8, 7) and is parallel to the graph of $y = \frac{3}{4}x + 2$.

Exercises

1. Writing Are the graphs of $y = \frac{2}{5}x + 3$ and $y = \frac{3}{5}x - 4$ parallel? Explain how you know.

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

2. (3, 1); $y = 2x + 4$

3. (1, 3); $y = 7x + 5$

4. (1, 6); $y = 9x - 5$

5. $(0, 0); y = -\frac{1}{2}y - 4$

6. $(-5, 7); y = -\frac{2}{5}x - 3$

7. $(6, 6); y = \frac{1}{3}x - 1$

Two lines that are neither horizontal nor vertical are perpendicular if the product of their slopes is 21. Th e graphs of $y = -\frac{4}{5}x - 5$ and $y = \frac{5}{4}x + 4$ are perpendicular because $-\frac{4}{5}\left(\frac{5}{4}\right) = -1$.

Problem

What is an equation in slope-intercept form of the line that passes through (2, 11) and is perpendicular to the graph of $y = \frac{1}{4}x - 5$?

The slope of $y = \frac{1}{4}x - 5$ is $\frac{1}{4}$. Since $\frac{1}{4}(-4) = -1$, the slope of the line perpendicular to the given line is –4.
Use this slope and the given point to write an equation in point-slope form. Then solve for *y* to write the equation in slope-intercept form.

$y - y_1 = m(x - x_1)$	Start with the point-slope form
$y - 11 = (-4x - 2)$	Substitute (2, 11) for (x_1, y_1) and –4 for *m*.
$y - 11 = -4x + 8$	Distributive Property
$y = -4x + 19$	Add 11 to each side.

The graph of $y = -4x + 19$ passes through (2, 11) and is perpendicular to the graph of $y = \frac{1}{4}x - 5$.

Exercises

8. Writing Are the graphs of $y = \frac{2}{3}x + 6$ and $y = -\frac{3}{2}x - 4$ parallel, perpendicular, or neither? Explain how you know.

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

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

9. (5, –3); $y = 5x + 3$

10, (4, 8); $y = -2x - 4$

11. (-2, -5); $y = x + 3$

12. $(6, 0); y = \frac{3}{2}x - 6$

13. (5, 3); $y = 5x + 2$

14. $(7, 1); y = -\frac{7}{2}x + 6$