Lesson 5-6

Example 1 Parallel Line Through a Given Point

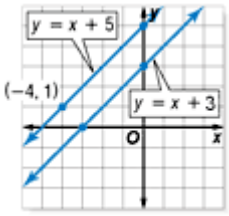
Write the slope-intercept form of an equation for the line that passes through (-4, 1) and is parallel to the graph of $y = x + 3$.

The line parallel to $y = x + 3$ has the same slope, 1. Replace m with 1, and (x_1, y_1) with (-4, 1) in the point-slope form.

$y - y_1 = m(x - x_1)$	Point-slope form
$y - 1 = 1(x - (-4))$	Replace m with 1, y_1 with 1, and x_1 with –4.
$y - 1 = 1(x + 4)$	Simplify
$y - 1 = x + 4$	Distributive Property
$y - 1 + 1 = x + 4 + 1$	Add 1 to each side.
$y = x + 5$	Write equation in slope-intercept form.

Therefore, the equation is $y = x + 5$.

Check: You can check your result by graphing both equations. The lines appear to be parallel. The graph of $y = x + 5$ passes through (-4, 1).



Example 2 Determine Whether Lines are Perpendicular

Determine whether $y = -\frac{2}{3}x + 1$ and $y = \frac{3}{2}x - 2$ are perpendicular.

Find the slope of each line.

The slope of $y = -\frac{2}{3}x + 1$ is $-\frac{2}{3}$.

The slope of $y = \frac{3}{2}x - 2$ is $\frac{3}{2}$.

The lines are perpendicular because $-\frac{2}{3}\left(\frac{3}{2}\right) = \frac{-6}{6}$ or –1.

Example 3 Perpendicular Line Through a Given Point

Write the slope-intercept form for an equation of a line that passes through (-3, 4) and is perpendicular to the graph of $9x - 6y = 3$.

Step 1: Find the slope of the given line.

$9x - 6y = 3$	Original equation
$9x - 6y - 9x = 3 - 9x$	Subtract $9x$ from each side.
$-6y = -9x + 3$	Simplify.
$\frac{-6y}{-6} = \frac{-9x+3}{-6}$	Divide each side by –6.
$y = \frac{3}{2}x - \frac{1}{2}$	Simplify.

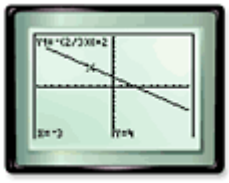
Step 2: The slope of the given line is $\frac{3}{2}$. So, the slope of the line perpendicular to this line is the opposite reciprocal of $\frac{3}{2}$, or $-\frac{2}{3}$.

Step 3: Use the point-slope form to find the equation.

$y - y_1 = m(x - x_1)$	Point-slope form
$y - 4 = -\frac{2}{3}(x - (-3))$	$(x_1, y_1) = (-3, 4)$ and $m = -\frac{2}{3}$
$y - 4 = -\frac{2}{3}(x + 3)$	Simplify
$y - 4 = -\frac{2}{3}x + (-2)$	Distributive Property
$y - 4 + 4 = -\frac{2}{3}x + (-2) + 4$	Add 4 to each side.
$y = -\frac{2}{3}x + 2$	Simplify.

Therefore, the equation of the line is $y = -\frac{2}{3}x + 2$.

Check: You can check your result by graphing both equations on a graphing calculator. Use the CALC menu to verify that $y = -\frac{2}{3}x + 2$ passes through (-3, 4).



Example 4 Perpendicular Line Through a Given Point

Write the slope-intercept form for an equation of a line perpendicular to the graph of $y = \frac{5}{6}x - 5$ and passes through the *y*-intercept of that line.

Step 1: Find the slope of the perpendicular line. The slope of the given line is $\frac{5}{6}$, therefore, a perpendicular line has slope $-\frac{6}{5}$ because $\frac{5}{6} \bullet -\frac{6}{5} = -1$.

Step 2: Find the y-intercept of the given line.

$y = \frac{5}{6}x - 5$ Original equation.

$y = \frac{5}{6}(0) - 5$ Replace x with 0.

$y = -5$ Simplify.

The *y*-intercept is at (0, -5).

Step 3: Substitute the slope and the given point into the slope-intercept form of an equation since you have both the slope and *y*-intercept.

$y = mx + b$ Slope-intercept form

$y = -\frac{6}{5}x + (-5)$ $m = -\frac{6}{5}$ and $b = -5$

$y = -\frac{6}{5}x - 5$ Simplify.

Therefore, the equation of the line is $y = -\frac{6}{5}x - 5$.