EXAMPLE 2 Write an equation given the slope and a point

Write an equation of the line that passes through (5, 4) and has a slope of −3.

Solution

Because you know the slope and a point on the line, use point-slope form to write an equation of the line. Let $(x_1, y_1) = (5, 4)$ and $m = -3$.

SIMPLIFY EQUATIONS
In this book, equations written in point-slope form will be simplified to slope-intercept form.

$y - y_1 = m(x - x_1)$ **Use point-slope form.**

$y - 4 = -3(x - 5)$ **Substitute for m, x_1, and y_1.**

$y - 4 = -3x + 15$ **Distributive property**

$y = -3x + 19$ **Write in slope-intercept form.**

EXAMPLE 3 Write equations of parallel or perpendicular lines

Write an equation of the line that passes through (−2, 3) and is (a) parallel to, and (b) perpendicular to, the line $y = -4x + 1$.

Solution

a. The given line has a slope of $m_1 = -4$. So, a line parallel to it has a slope of $m_2 = m_1 = -4$. You know the slope and a point on the line, so use the point-slope form with $(x_1, y_1) = (-2, 3)$ to write an equation of the line.

$y - y_1 = m_2(x - x_1)$ **Use point-slope form.**

$y - 3 = -4(x - (-2))$ **Substitute for m_2, x_1, and y_1.**

$y - 3 = -4(x + 2)$ **Simplify.**

$y - 3 = -4x - 8$ **Distributive property**

$y = -4x - 5$ **Write in slope-intercept form.**

b. A line perpendicular to a line with slope $m_1 = -4$ has a slope of $m_2 = -\frac{1}{m_1} = \frac{1}{4}$. Use point-slope form with $(x_1, y_1) = (-2, 3)$.

$y - y_1 = m_2(x - x_1)$ **Use point-slope form.**

$y - 3 = \frac{1}{4}(x - (-2))$ **Substitute for m_2, x_1, and y_1.**

$y - 3 = \frac{1}{4}(x + 2)$ **Simplify.**

$y - 3 = \frac{1}{4}x + \frac{1}{2}$ **Distributive property**

$y = \frac{1}{4}x + \frac{7}{2}$ **Write in slope-intercept form.**

GUIDED PRACTICE for Examples 2 and 3

4. Write an equation of the line that passes through (−1, 6) and has a slope of 4.

5. Write an equation of the line that passes through (4, −2) and is **(a)** parallel to, and **(b)** perpendicular to, the line $y = 3x - 1$.