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Example 3
Determine Line Relationships When Given Equations

e. $x = -2$; $x = 4$

Both lines are vertical with undefined slope. Vertical lines are always parallel.

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Example 3
Determine Line Relationships When Given Equations

Check

Determine whether each pair of lines is *parallel*, *perpendicular*, or *neither*.

a. $y = 3x - 9$; $y = -\frac{1}{3}x + 2$

b. $y = \frac{9}{7}x - \frac{19}{7}$; $y - 1 = \frac{9}{7}(x + 3)$

c. $x = -3$; $x = 4$

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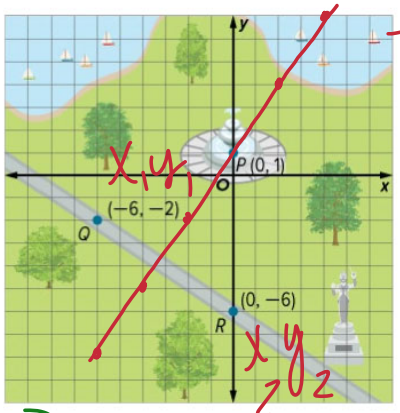
Example 4

Example 4
Use Slope to Graph a Line

DESIGN Valentina is designing a park using grid paper. She wants to build a sidewalk that connects with the fountain at $P(0, 1)$ and is perpendicular to the existing sidewalk that passes through points $Q(-6, -2)$ and $R(0, -6)$. Graph the line that represents the new sidewalk.



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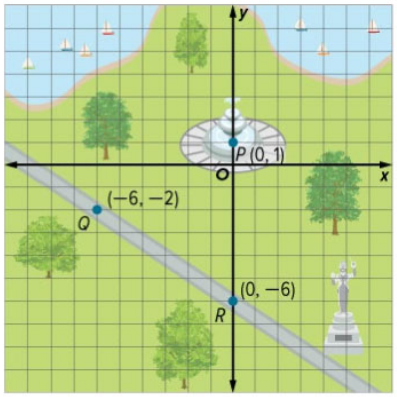
Example 4
Use Slope to Graph a Line

The slope of the existing sidewalk, $\overleftrightarrow{QR}$, is $\frac{-6-(-2)}{0-(-6)} = -\frac{4}{6}$ or $-\frac{2}{3}$.

Because $-\frac{2}{3}\left(\frac{3}{2}\right) = -1$, the slope of the line perpendicular to $\overleftrightarrow{QR}$ through P is $\frac{3}{2}$.

Graph the line that represents the new sidewalk.



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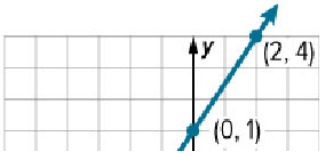
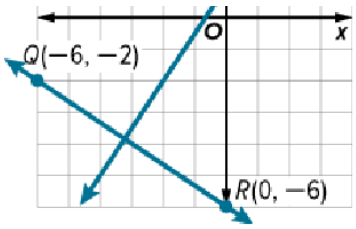
Example 4
Use Slope to Graph a Line

Step 1 Use the slope.

Use the slope of the line perpendicular to $\overleftrightarrow{QR}$ to find another point on the line that passes through



point $P(0, 1)$. From $P(0, 1)$, move up 3 units and then right 2 units. Plot a point at this location.



Step 2 **Graph the line connecting these two points.**

The new sidewalk will pass through $P(0, 1)$ and the new point that you plotted.

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Example 5
Write Equations of Parallel and Perpendicular Lines

Write an equation in slope-intercept form for the line parallel to $y = -\frac{3}{4}x + 3$ containing (−3, 6).

Slope $-\frac{3}{4}$

$-\frac{3}{4} \cdot \frac{3}{1} = -\frac{9}{4}$

$y - y_1 = m(x - x_1)$

$y - 6 = -\frac{3}{4}(x + 3)$

$y - 6 = -\frac{3}{4}x - \frac{9}{4}$

$+6 \quad +\frac{6}{1} \quad \frac{24}{4}$

$y = mx + b$

$6 = -\frac{3}{4}(-3) + b$

$6 = \frac{9}{4} + b$

$-\frac{9}{4} \quad -\frac{9}{4}$

$y = -\frac{3}{4}x + \frac{15}{4}$

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Example 5
Write Equations of Parallel and Perpendicular Lines

The slope of $y = -\frac{3}{4}x + 3$ is $-\frac{3}{4}$, so the slope of a line parallel to it is $-\frac{3}{4}$.

$y = mx + b$	Slope-intercept form
$6 = -\frac{3}{4}(-3) + b$	$m = -\frac{3}{4}$ and $(x, y) = (-3, 6)$
$6 = \frac{9}{4} + b$	Simplify.
$\frac{15}{4} = b$	Subtract $\frac{9}{4}$ from each side.

So, the equation is $y = -\frac{3}{4}x + \frac{15}{4}$.

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Example 5
Write Equations of Parallel and Perpendicular Lines

Check

Write an equation in slope-intercept form for the line parallel to $y = \frac{1}{2}x + \frac{5}{2}$ containing $\left(\frac{3}{2}, 1\right)$.

Same slope

$y = mx + b$

$\frac{1}{2} \cdot \frac{-3}{2} = \frac{-3}{4}$

$y = \frac{1}{2}x + \frac{1}{4}$

$x, y,$ $y - y_1 = m(x - x_1)$

$y - 1 = \frac{1}{2}\left(x - \frac{3}{2}\right)$

$y - 1 = \frac{1}{2}x - \frac{3}{4}$

$+1 \quad +1$

$-\frac{3}{4} \quad \frac{4}{4} \quad \frac{1}{4}$

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Example 5
Write Equations of Parallel and Perpendicular Lines

Check

Write an equation in slope-intercept form for the line parallel to $y = \frac{1}{2}x + \frac{5}{2}$ containing $\left(\frac{3}{2}, 1\right)$.

$y = \frac{1}{2}x + \frac{1}{4}$

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Exit Ticket

Write the equation of the line parallel to the given line and

Write the equation of the line parallel to the given line and containing the given point.

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

2. $x + 2y = 6, (4, 3)$

Write the equation of the line perpendicular to the given line and containing the given point.

3. $-3x + 4y = 16, (3, 2)$

4. $4x - y = 9, (8, -6)$

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Exit Ticket

Write the equation of the line parallel to the given line and containing the given point.

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

2. $x + 2y = 6, (4, 3)$ $y = -\frac{1}{2}x + 5$

Write the equation of the line perpendicular to the given line and containing the given point.

3. $-3x + 4y = 16, (3, 2)$ $y = -\frac{4}{3}x + 6$

4. $4x - y = 9, (8, -6)$ $y = -\frac{1}{4}x - 4$

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