

4.3 Writing Equations of Parallel & Perpendicular Lines with work

Algebra 1: 4.3 Writing Equations of Parallel & Perpendicular Lines

Learning Outcomes:

- I can write and identify equations of parallel lines.
- I can write and identify equations of perpendicular lines.
- I can use parallel and perpendicular lines in real-life problems.

Core Concept

Parallel Lines and Slopes

Two lines in the same plane that never intersect are **parallel lines**. Nonvertical lines are parallel if and only if they have the same slope.

All vertical lines are parallel.

Why does it say "in the same plane"?

Separate planes means skew lines.

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Example 1:

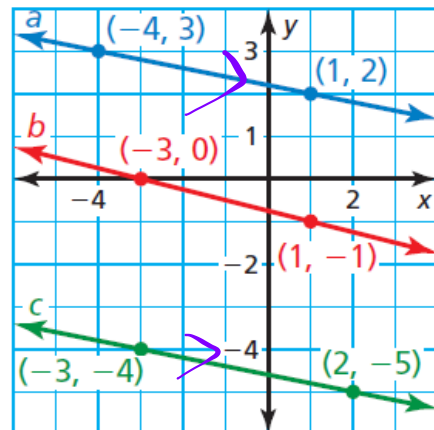
Determine which of the lines are parallel.

$$a: \frac{2-3}{1+4} = -\frac{1}{5}$$

$$b: \frac{-1-0}{1+3} = -\frac{1}{4}$$

$$c: \frac{-4+5}{-3-2} = \frac{1}{-5}$$

all c



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4.3 Writing Equations of Parallel & Perpendicular Lines with work

Examples:

2) Write the equation of a line that passes through (3, 1) and is parallel to the line $y = 3x + 1$. $m = 3$

$$y - 1 = 3(x - 3)$$

3) Write the equation of a line that passes through (-4, 2) and is parallel to the line $y = \frac{1}{4}x + 1$. $m = \frac{1}{4}$

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

4) Write the equation of a line that is parallel to $4x + 2y = 6$ and passes thru (0, 10). $m = -\frac{4}{2} = -2$

$$y = -2x + 10$$

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Example 5:

Line a passes through (-5, 3) and (-6, -1). Line b passes through (3, -2) and (2, -7). Are the lines parallel? Explain.

$$a: \frac{-1 - 3}{-6 - 5} = \frac{-4}{-1} = 4$$

$$b: \frac{-7 - 2}{2 - 3} = \frac{-5}{-1} = 5$$

no,
 $4 \neq 5$

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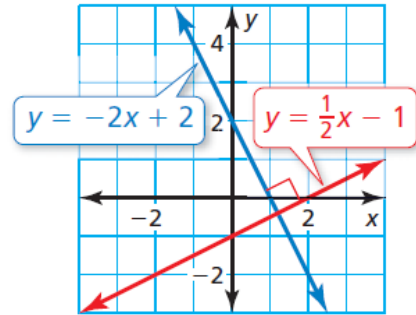
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Core Concept

Perpendicular Lines and Slopes

Two lines in the same plane that intersect to form right angles are **perpendicular lines**. Nonvertical lines are perpendicular if and only if their slopes are negative reciprocals.

Vertical lines are perpendicular to horizontal lines.



slope of original = m

slope perpendicular = m_{\perp}

m	m_{\perp}
-2	$\frac{1}{2}$
$\frac{1}{3}$	-3
$-\frac{4}{7}$	$\frac{7}{4}$

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Example 6:

Determine which of the lines, if any, are parallel or perpendicular. Explain.

Line a: $2x + 6y = -3$ $m = -\frac{2}{6} = -\frac{1}{3}$

Line b: $y = 3x - 8$ $m = 3$

Line c: $-6y + 18x = 9$ $m = \frac{-18}{-6} = 3$

$b \parallel c; a \perp b; a \perp c$

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Example 7:

Write an equation of the line that passes through $(-3, 5)$ and is perpendicular to the line $y = -3x - 1$.

$$m_{\perp} = \frac{1}{3}$$

$$y - 5 = \frac{1}{3}(x + 3)$$

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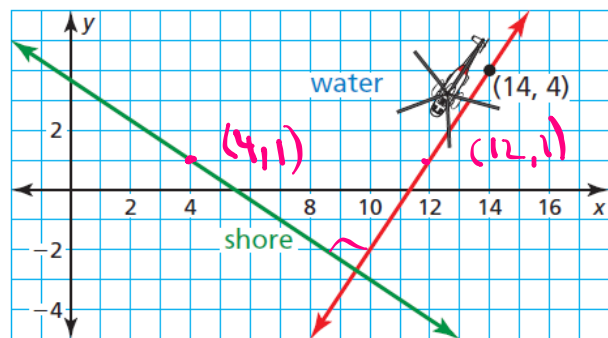
Example 8:

The position of a helicopter search and rescue crew is shown in the graph. The shortest flight path to the shoreline is one that is perpendicular to the shoreline. Write an equation that represents this path.

$$m = \frac{4-1}{14-12} = \frac{3}{2}$$

$$m_{\perp} = -\frac{2}{3} \quad (4, 1)$$

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



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4.3 Assignment

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