

Algebra 1 4.4

Write the equation of a line parallel to a given line

Write the equation of a line perpendicular to a given line

What (two things) do we need to write an equation for any line?

Slope  $(x, y)$

slope

vertical

horizontal

//

parallel

← Same Slope

⊥

perpendicular

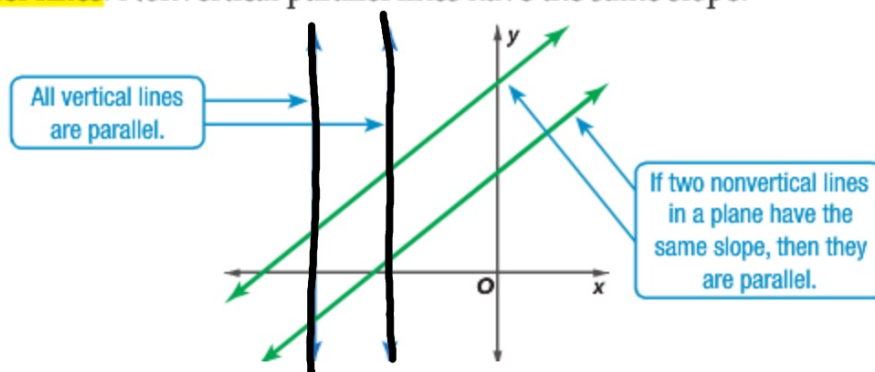
← opp + reciprocal

whiteboards

$-\frac{2}{5}$     $\frac{5}{2}$

Quiz moves to Thurs.

**1 Parallel Lines** Lines in the same plane that do not intersect are called **parallel lines**. Nonvertical parallel lines have the same slope.



## Whiteboards

$$y = mx + B$$

$$y = 1x - 1$$

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

1.  $(-1, 2), y = \frac{1}{2}x$

2.  $(0, 4), y = -4x + 5$

$(x, y) \quad m = \frac{1}{2}$

$$2 \frac{1}{2}$$

$$25$$

$$2 = \frac{1}{2} \cdot -1 + B$$

$$y = \frac{1}{2}x + \frac{5}{2}$$

$$2 = -\frac{1}{2} + B$$

$$+\frac{1}{2} \quad +\frac{1}{2}$$

$$2 \frac{1}{2} = B$$

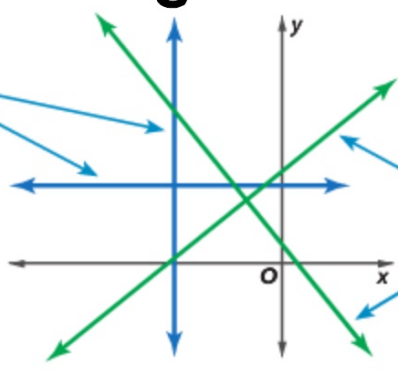
**2 Perpendicular Lines** Lines that intersect at right angles are called **perpendicular lines**. The slopes of nonvertical perpendicular lines are opposite reciprocals. That is, if the slope of a line is 4, the slope of the line perpendicular to it is  $-\frac{1}{4}$ .

$$y = mx + B$$

$$\Rightarrow y = B + mx$$

0  
-1/

Vertical lines and horizontal lines are perpendicular.



If the product of the slopes of two nonvertical lines is  $-1$ , then the lines are perpendicular.

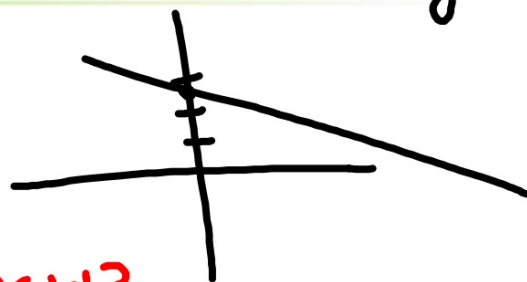
Guided Practice

$$y = -1x + 3 \quad \begin{matrix} 1 & -1 \\ x & y \end{matrix}$$

4. Write an equation in slope-intercept form for the line that passes through  $(4, 7)$  and is perpendicular to the graph of  $y = \frac{2}{3}x$

$$m = -\frac{3}{2}$$

$$\frac{2}{-3}$$



$$7 = -\frac{3}{2} \cdot 4 + B$$

$$7 = -6 + B \quad B = 13$$

$$y = -\frac{3}{2}x + 13$$

How is this problem different?

$$y = mx + B$$

$$y = -\frac{3}{2}x + 12$$

**Example 4** Perpendicular Line Through a Given Point

PT

Write an equation in slope-intercept form for the line that passes through  $(-4, 6)$  and is perpendicular to the graph of  $2x + 3y = 12$ .

$$m = \frac{3}{2}$$

$$b = \frac{3}{2} \cdot -4 + B$$

$$b = -6 + B$$

$$12 = B - 6$$

$$\begin{array}{r} -2x \quad -2x \\ \hline 3y = -2x + 12 \\ \frac{3y}{3} = \frac{-2x}{3} + \frac{12}{3} \\ y = -\frac{2}{3}x + 4 \end{array}$$

## Whiteboards

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

**7.**  $(-2, 3), y = -\frac{1}{2}x - 4$

**8.**  $(-1, 4), y = 3x + 5$

**9.**  $(2, 3), 2x + 3y = 4$

**10.**  $(3, 6), 3x - 4y = -2$



**ConceptSummary** Parallel and Perpendicular Lines

	Parallel Lines	Perpendicular Lines
<b>Words</b>	Two nonvertical lines are parallel if they have the same slope.	Two nonvertical lines are perpendicular if the product of their slopes is $-1$ .
<b>Symbols</b>	$\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$	$\overleftrightarrow{EF} \perp \overleftrightarrow{GH}$
<b>Models</b>		

**ReadingMath**

**Parallel and Perpendicular Lines** The symbol for parallel is  $\parallel$ . The symbol for perpendicular is  $\perp$ .

3. Determine whether the graphs of  $6x - 2y = -2$ ,  $y = 3x - 4$ , and  $y = 4$  are parallel or perpendicular. Explain.

$$\begin{array}{r} 6x - 2y = -2 \\ -6x \quad -6x \end{array} \quad || \quad y = 3x - 4$$

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$$\begin{array}{r} -2y = -6x - 2 \\ \frac{-2y}{-2} = \frac{-6x}{-2} - \frac{2}{-2} \\ y = 3x + 1 \end{array}$$

$$\begin{array}{l} m = 0 \\ y = 4 \\ y = -4x + 3 \\ y = -\frac{3}{4}x \end{array}$$

~~$$y = 5x \quad y = \frac{-1}{5}x + \frac{5}{5}$$~~

$$y = 5x$$

$$\frac{5y}{5} = \frac{-1x}{5}$$

$$y = \frac{-1}{5}x$$

$$y = 4x$$

per p

$$\begin{array}{r} x + 4y = 12 \\ -x \quad \quad -x \\ \hline \end{array}$$

$$4y = \frac{-x}{4} + \frac{12}{4}$$

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

$$\begin{array}{r} 4x + y = -1 \\ -4x \quad \quad -4x \\ \hline \end{array}$$

$$y = -4x - 1$$