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 do we need to write an equation for a line?

slope

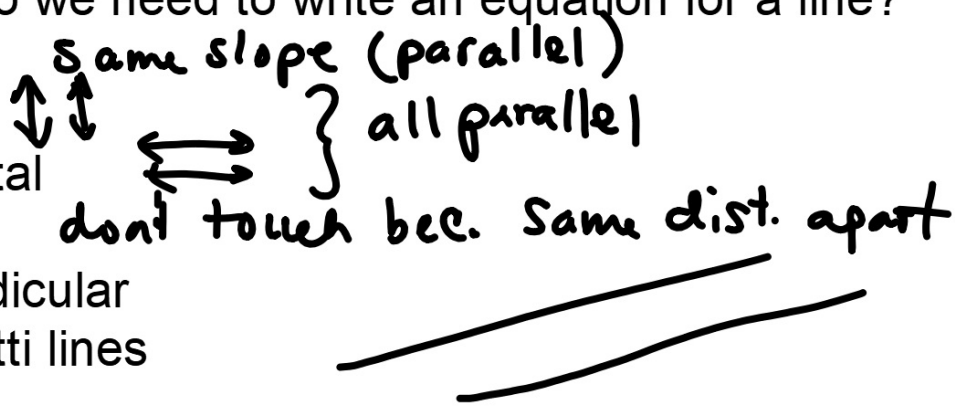
vertical

horizontal

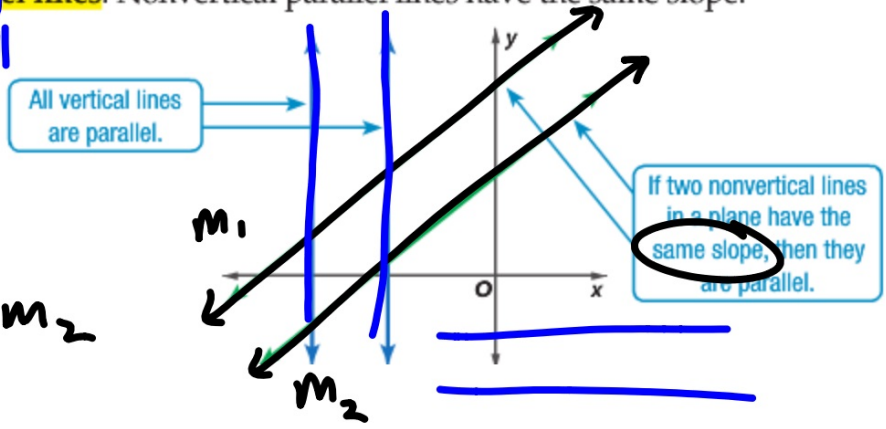
parallel

perpendicular

spaghetti lines



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



$m_1 = m_2$

Example 1 Parallel Line Through a Given Point

Write an equation in slope-intercept form for the line that passes through $(-3, 5)$ and is parallel to the graph of $y = 2x - 4$.

What do we need to know?

Slope + point

$m = 2$ $(-3, 5)$

$y = mx + B$

$5 = 2 \cdot -3 + B$

$5 = -6 + B$

$+6 \quad +6$

$11 = B$

$y = 2x + 11$

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1. Write an equation in point-slope form for the line that passes through $(4, -1)$ and is parallel to the graph of $y = \frac{1}{4}x + 7$.

What do we need to know?

$y - ? = m(x - ?)$

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

Whiteboards

$y = mx + B$

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

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

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

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

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

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

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

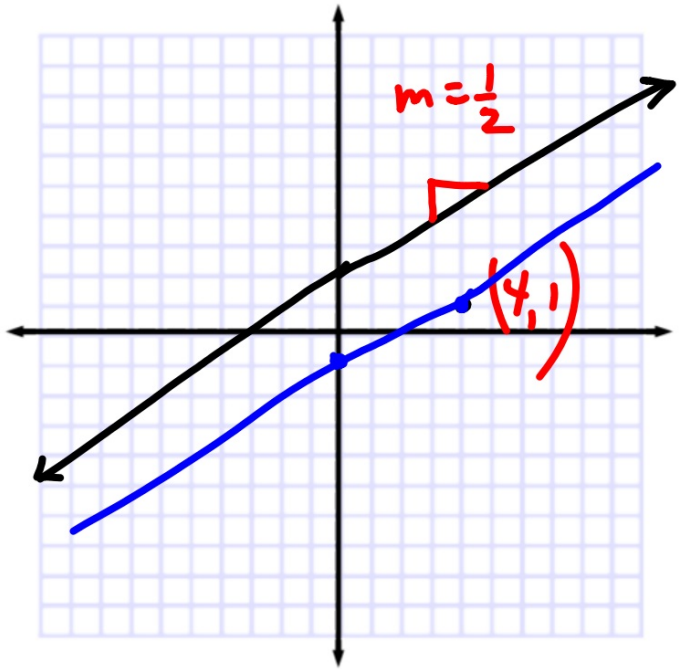
$4 = -4 \cdot 0 + B$

$4 = 0 + B$

$4 = B$

$y = -4x + 4$

What does it look like when 2 lines are perpendicular?



$1 = \frac{1}{2} \cdot 4 + B$

$1 = 2 + B$

$-2 \quad -2$

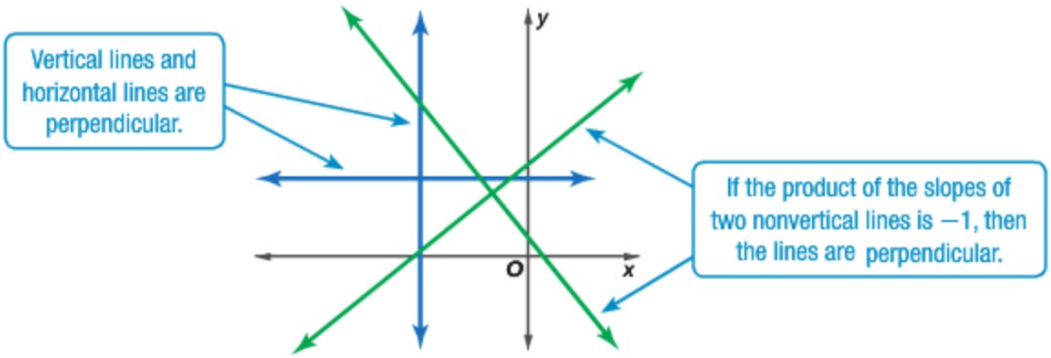
$-1 = B$

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

Desmos exploration

If 2 lines are perpendicular...
(what?)

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 $-\frac{1}{4}$.

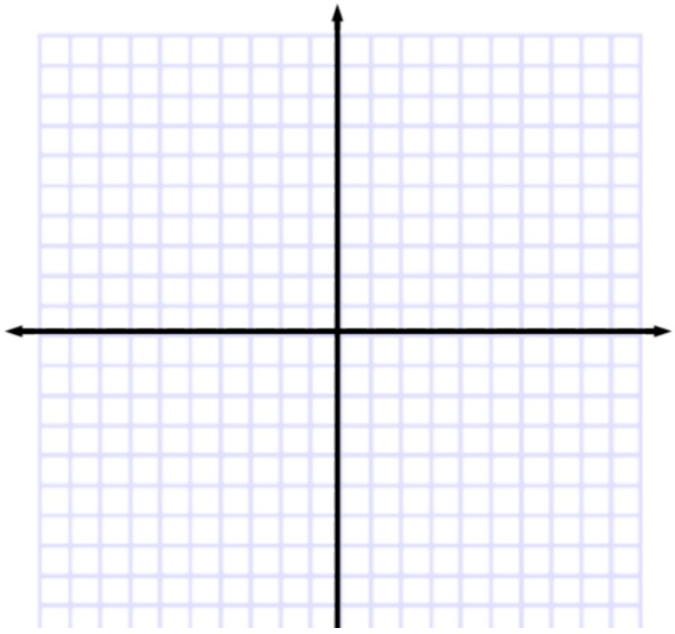


Partners:
One person write a slope.
Other person writes the perpendicular to the slope.

Eyeball is not enough…

GuidedPractice

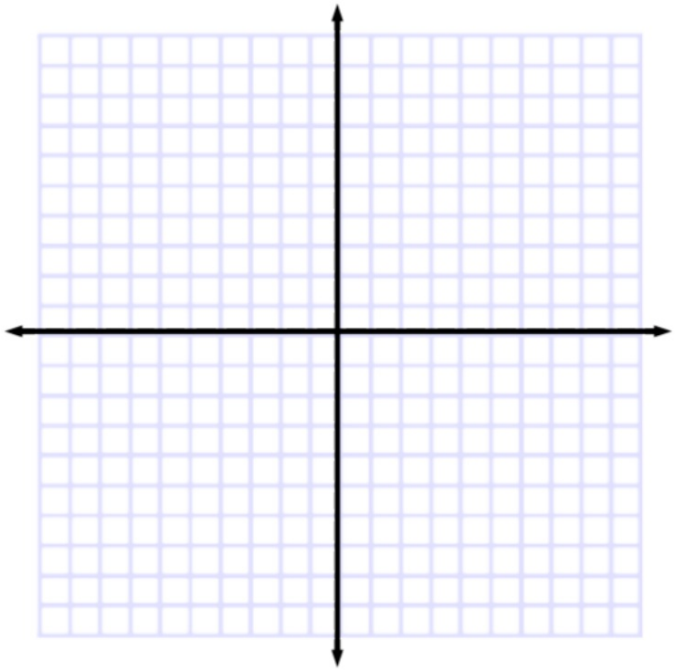
2. CONSTRUCTION On the plans for a treehouse, a beam represented by $\overline{QR}$ has endpoints $Q(-6, 2)$ and $R(-1, 8)$. A connecting beam represented by $\overline{ST}$ has endpoints $S(-3, 6)$ and $T(-8, 5)$. Are the beams perpendicular? Explain.



Example 3 Parallel or Perpendicular Lines

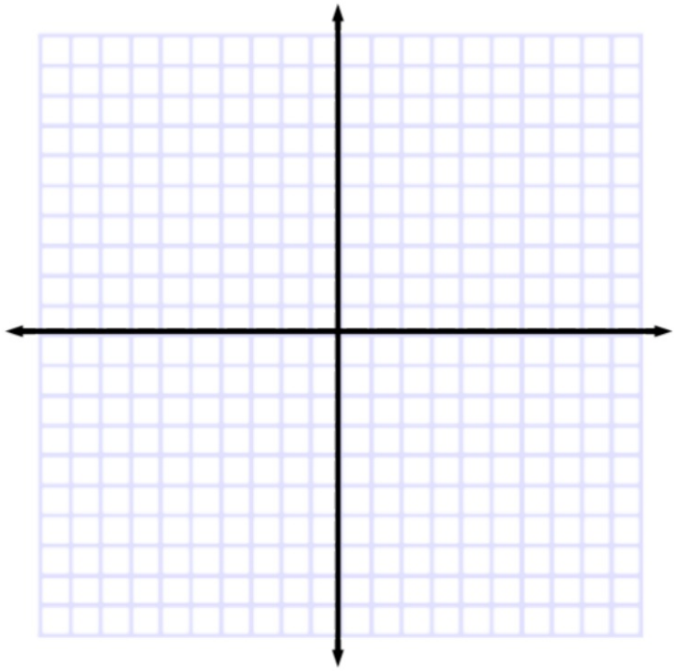
Determine whether the graphs of $y = 5$, $x = 3$, and $y = -2x + 1$ are *parallel* or *perpendicular*. Explain.

What do we need to know so that we can answer the question?



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

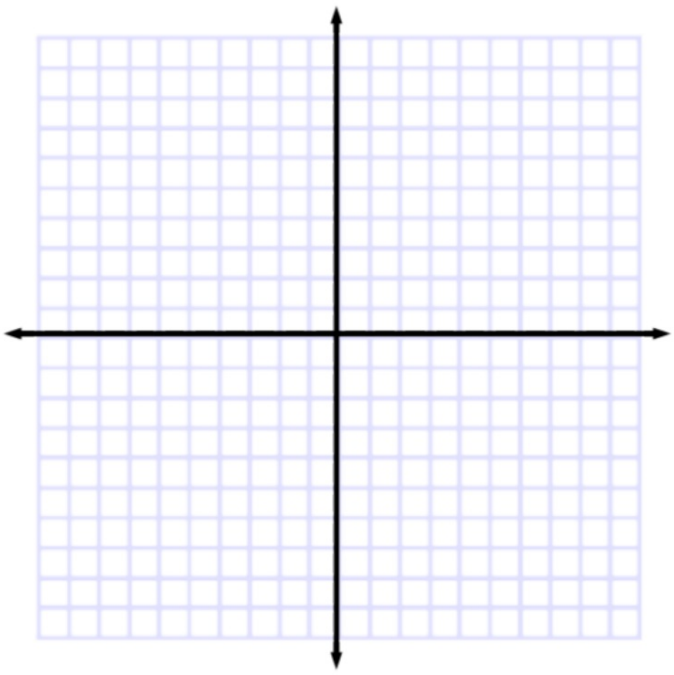
What do we need to know?



Example 4 Perpendicular Line Through a Given Point

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

What do we need to know?



What do we need to know?

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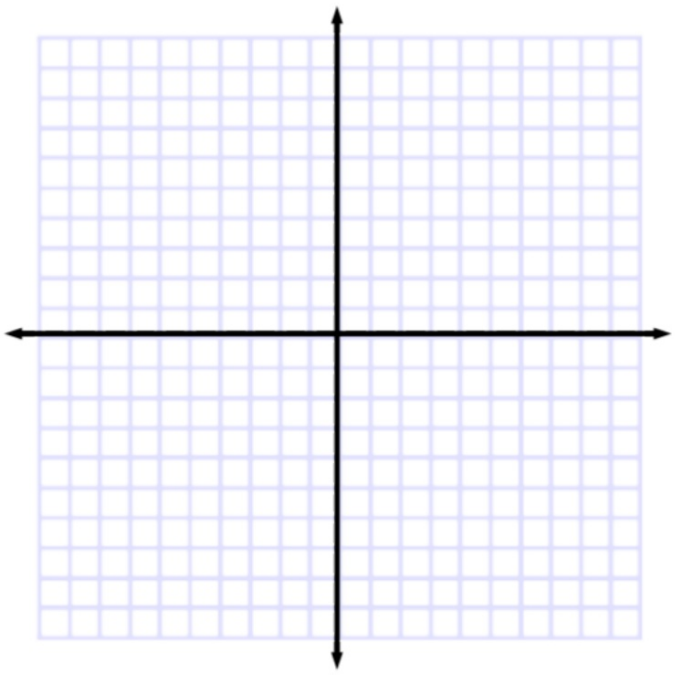
4. Write an equation in slope-intercept form for the line that passes through (4,7) and is perpendicular to the graph of $y = \frac{2}{3}x - 1$.



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

What do we need to know?