

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 $m = \frac{y-y}{x-x}$

vertical $x = 3$

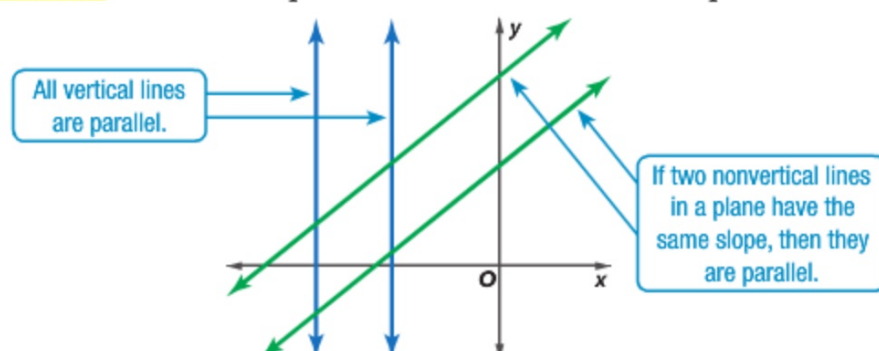
horizontal $y = -2$

• parallel - same slope. $y = mx + b$ $y - ? = m(x - ?)$

• perpendicular meet @ 90°, m is opp + recp

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.



Slope = ? (x, y)



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 $y = 2x - 4$.

x y

↑

What do we need to know?

$$y = mx + B$$

$$5 = 2 \cdot -3 + B$$

$$y = 2x + 11$$

$$\begin{array}{r} 5 = -6 + B \\ +6 \quad +6 \\ \hline 11 = B \end{array}$$

Guided Practice

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

What do we need to know?

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

Whiteboards

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

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

$$y = mx + B$$

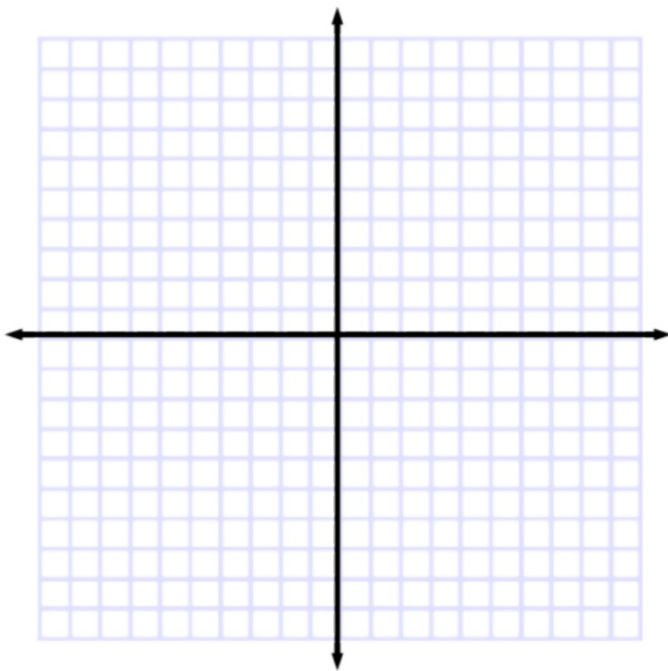
$$2 = \frac{1}{2}(-1) + B$$

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

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

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

What does it look like when 2
lines are perpendicular?



graphing calc

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

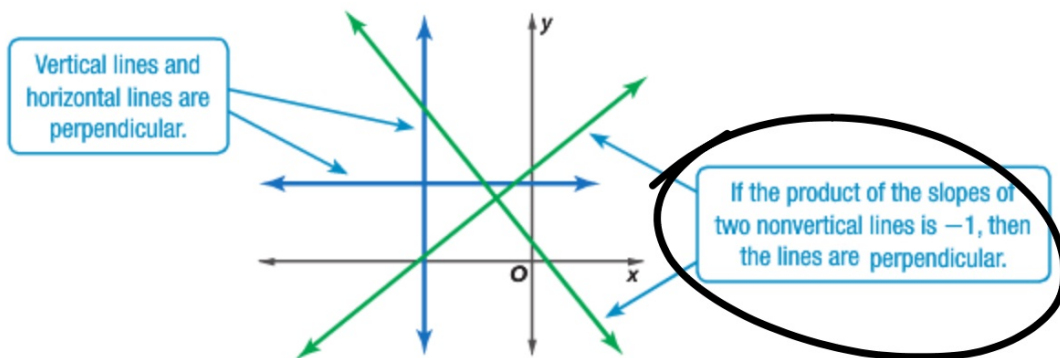
opp & reciprocal

$$\left(\frac{2}{1}\right) \cdot \left(-\frac{1}{2}\right) = -1$$

$$\left(\frac{5}{2}\right) \cdot \left(-\frac{2}{5}\right) = -1$$

0 -1

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.

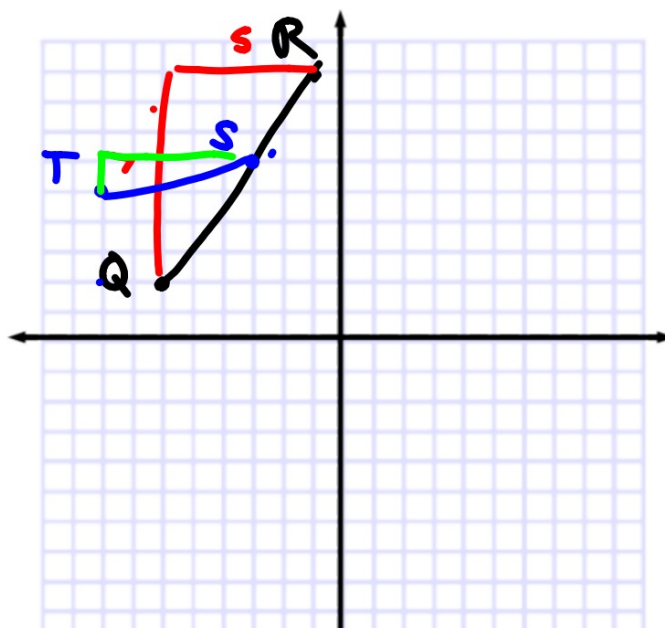
Other person writes the perpendicular to the slope.

Eyeball is not enough...

Guided Practice

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.

$$\left. \begin{array}{l} m \overline{QR} = \frac{2}{5} \\ m \overline{ST} = \frac{1}{5} \end{array} \right\}$$



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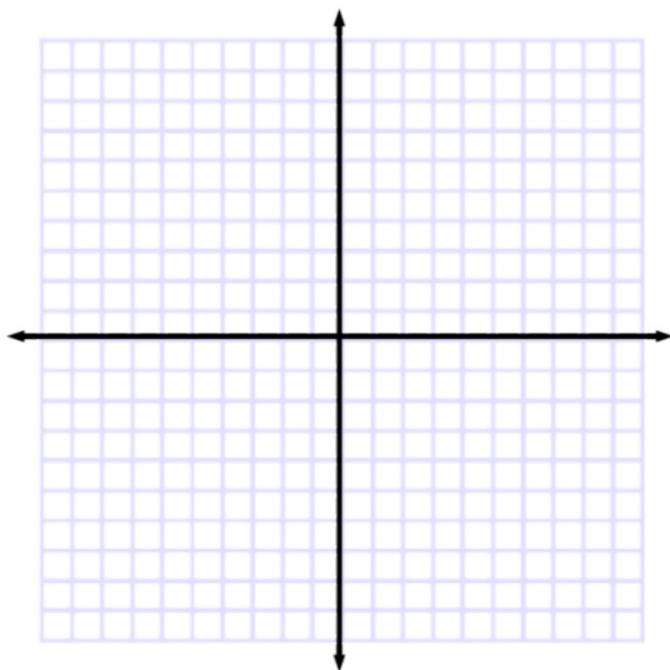
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Example 3 Parallel or Perpendicular Lines

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

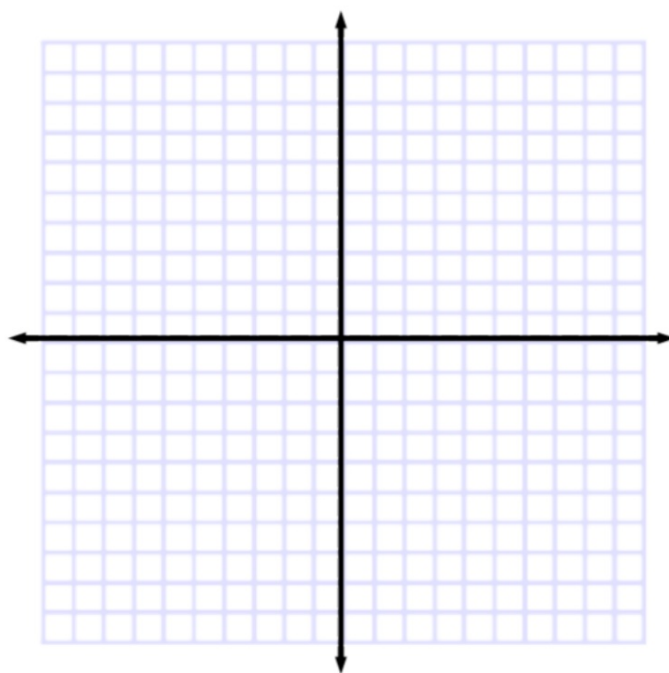
perp: $x = 3$ & $y = 5$ ↑
 $m = -2$

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.

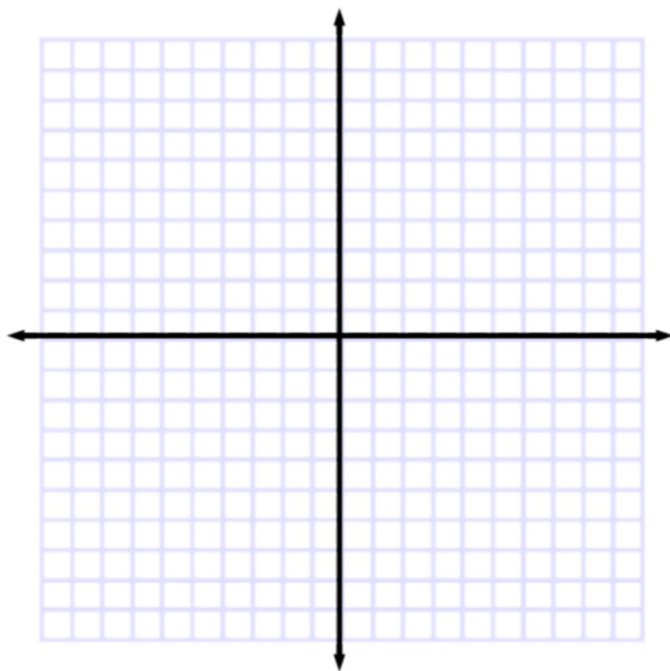
What do we need to know?



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 $2x + 3y = 12$.

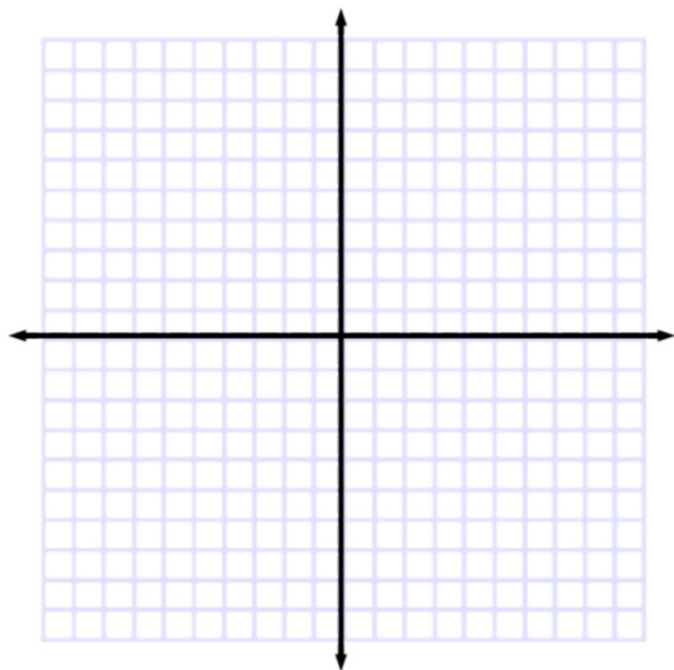
What do we need to know?



What do we need to know?

GuidedPractice

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

