

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

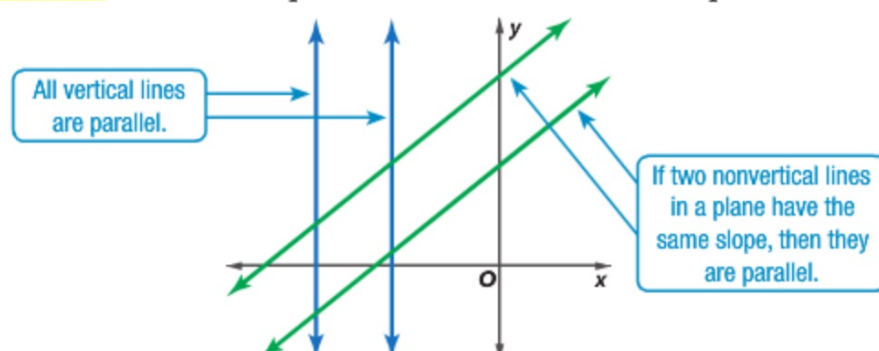
horizontal

// parallel same slope

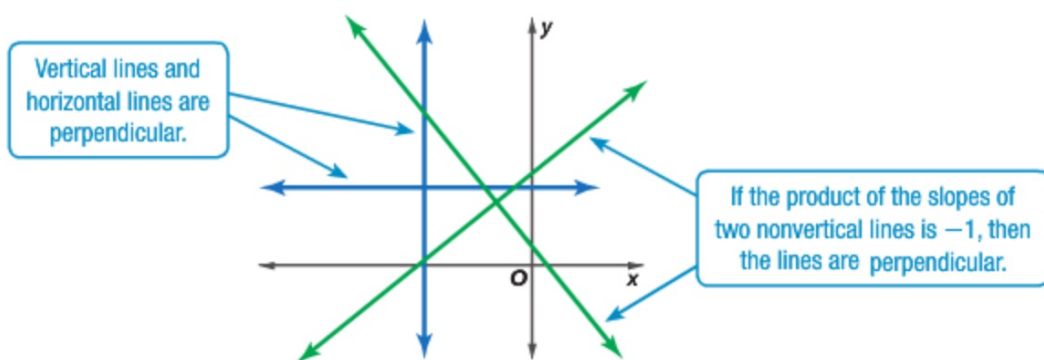
⊥ perpendicular opp + reciprocal

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.



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



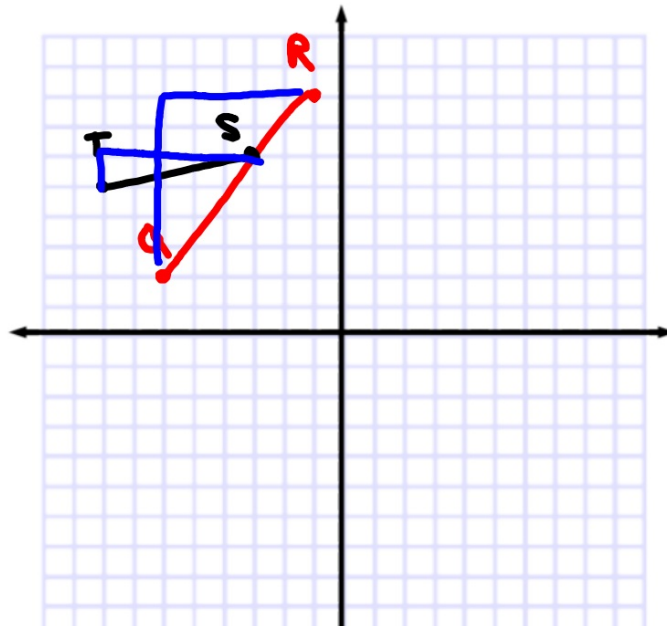
Eyeball is not enough...

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.

$$\text{slope } \overline{ST} = \frac{1}{5} \quad \text{Not opp recip.}$$

$$\text{slope } \overline{QR} = \frac{6}{5}$$



Example 3 Parallel or Perpendicular Lines

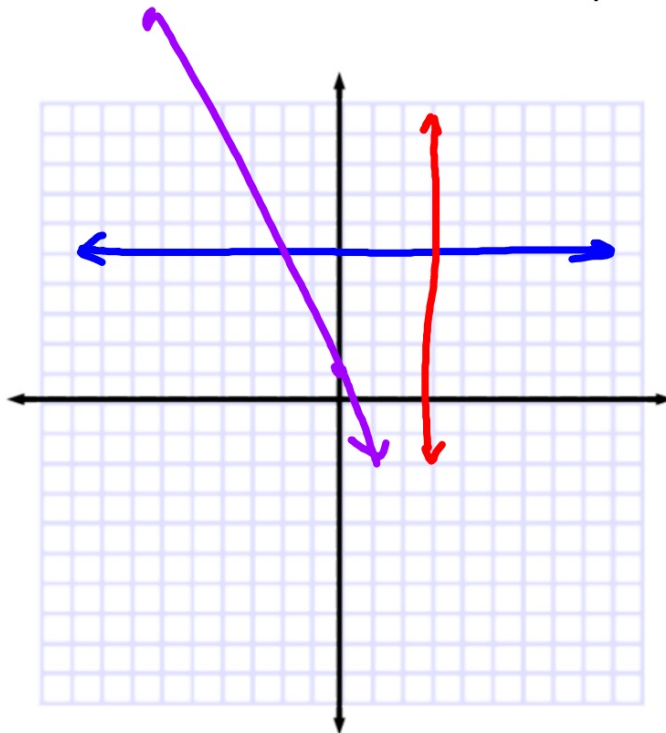
Determine whether the graphs of $y = 5$, $x = 3$, and $y = -2x + 1$ are parallel or perpendicular. Explain.

1

no

yes - one vert!
one horiz.

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.

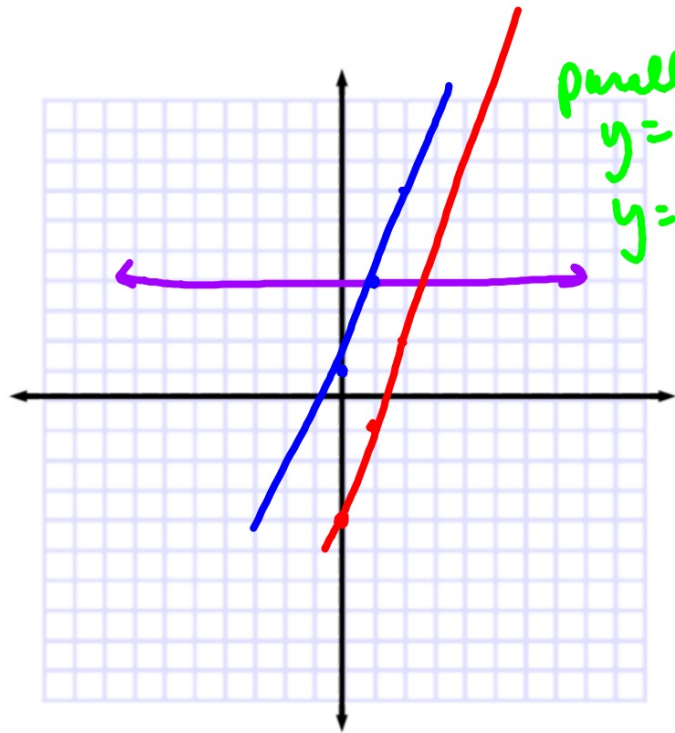
$$y = mx + b$$

What do we need to know?

$$\begin{array}{r} 6x - 2y = -2 \\ -6x \quad -6x \\ \hline \end{array}$$

$$\frac{-2y}{-2} = \frac{-6x - 2}{-2} \quad \frac{-2}{-2}$$

$$y = 3x + 1$$



parallel
 $y = 3x - 4$
 $y = 3x + 1$

$$y = mx + B$$

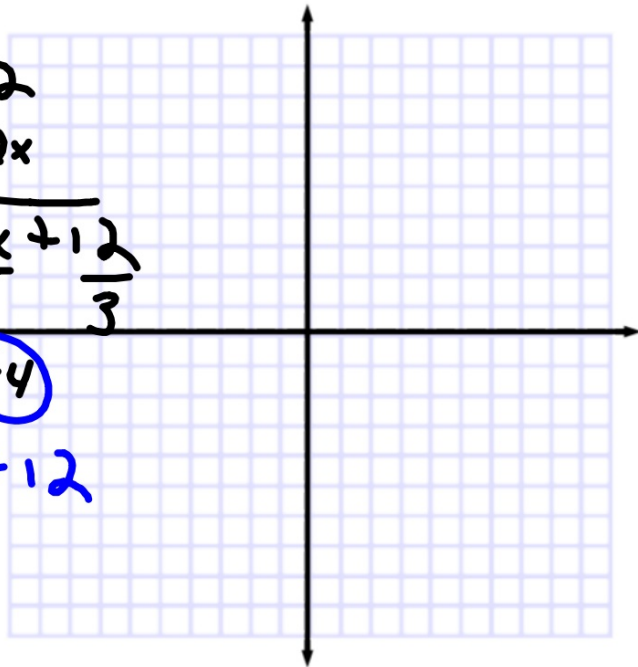
Example 4 Perpendicular Line Through a Given Point

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?

$$\begin{aligned} &(-4, 6) \\ &m = +\frac{3}{2} \\ &6 = \frac{3}{2} \cdot (-4) + B \\ &6 = -6 + B \\ &\quad +6 \quad +6 \\ &\hline &B = 12 \end{aligned}$$

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



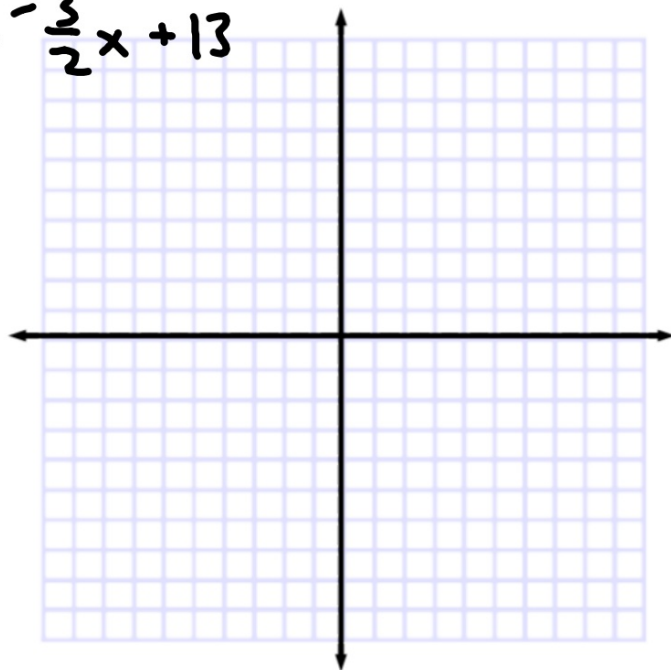
What do we need to know?

Guided Practice

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

$$\begin{aligned} 7 &= -\frac{3}{2} \cdot 4 + B \\ 7 &= -6 + B \\ \begin{array}{r} +6 \\ +6 \\ \hline 13 = B \end{array} \end{aligned}$$

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



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

$$y = 2x + 7$$

What do we need to know?

$$\begin{array}{r} 3 = 2 \cdot -2 + b \\ 3 = -4 + b \\ \hline 7 = b \end{array}$$

