Algebra 1 4.4

Write the equation of a line parallel to a given line (same slope)

Write the equation of a line perpendicular to a given line

What do we need to write an equation for a line?

slope

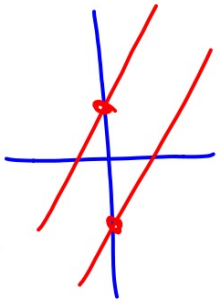
vertical ↕ $x =$

horizontal ↔ $y =$

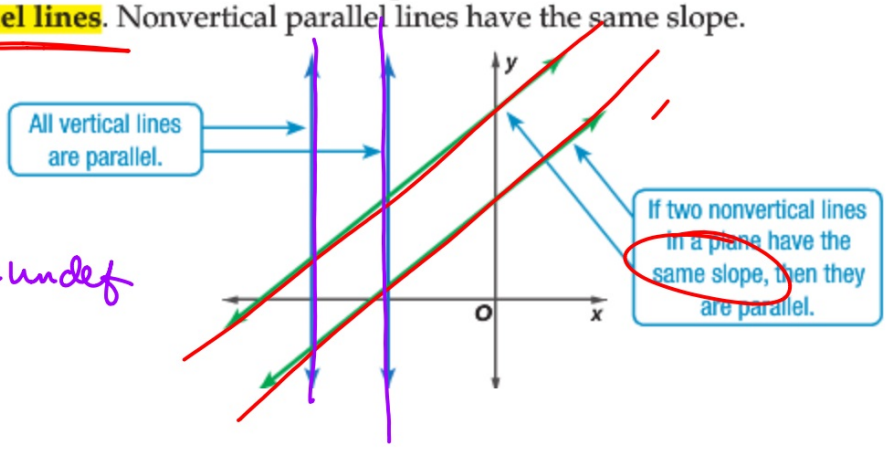
parallel Same slope $m = \frac{\text{rise}}{\text{run}}$

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.



undef = undef

$y - 5 = 2(x - 0)$

pt. slope

$y = mx + B$

$m = 2$

Write the equation of a line parallel to...

$y = 2x + 3$ $\quad m = 2$

$(0, 5)$ $\quad x \; y$

$y = \frac{1}{4}x - 6$ $\quad (1, 8)$ $\quad x \; y$

$m = \frac{1}{4}$

$y - 8 = \frac{1}{4}(x - 1)$

$y - 5 = 2(x - 0)$

$y = -3x + 8$ $\quad (3, 6)$

$y = \frac{2}{3}x + 5$ $\quad (4, 8)$

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

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

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

$+4 \quad +4$

$y = -\frac{1}{2}x + 3\frac{1}{2}$

$y = mx + b$

opposite reciprocal

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

$y = 4x$

$y = -0.25x$

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

5/10

meet at 90° angle

$y = 2x + 0$

$y = -0.5x + 0$ } perp.

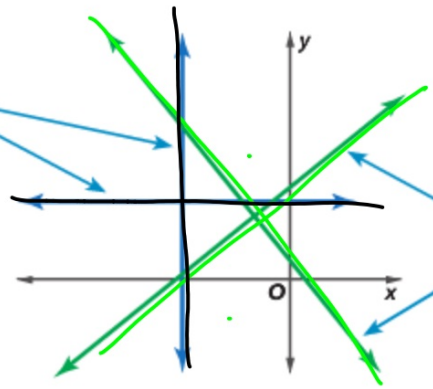
$\frac{1}{2}$

2/10

$y = 5x$

$y = -0.2x$

$-\frac{1}{5}$



Vertical lines and horizontal lines are perpendicular.

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

What do we need to know?

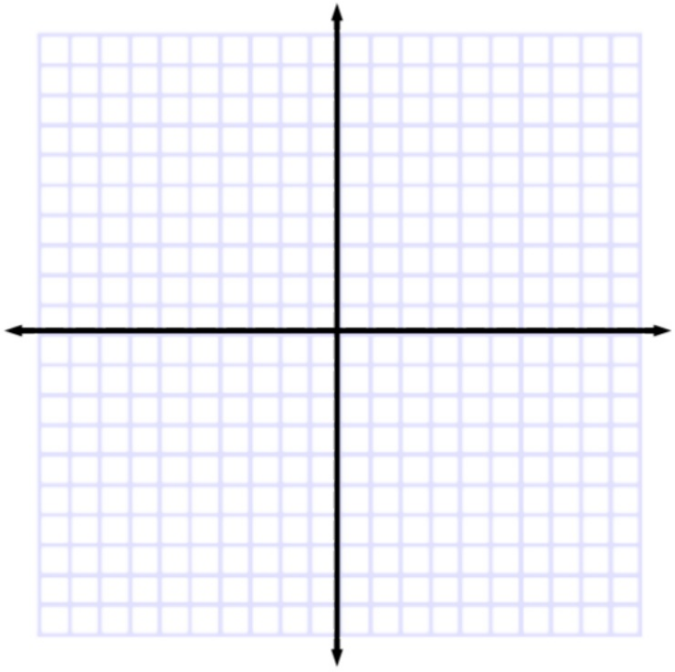
GuidedPractice PT-slope

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

x y

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

$y - 7 = -\frac{3}{2}(x - 4)$



What do we need to know?

Guided Practice

pt. slope

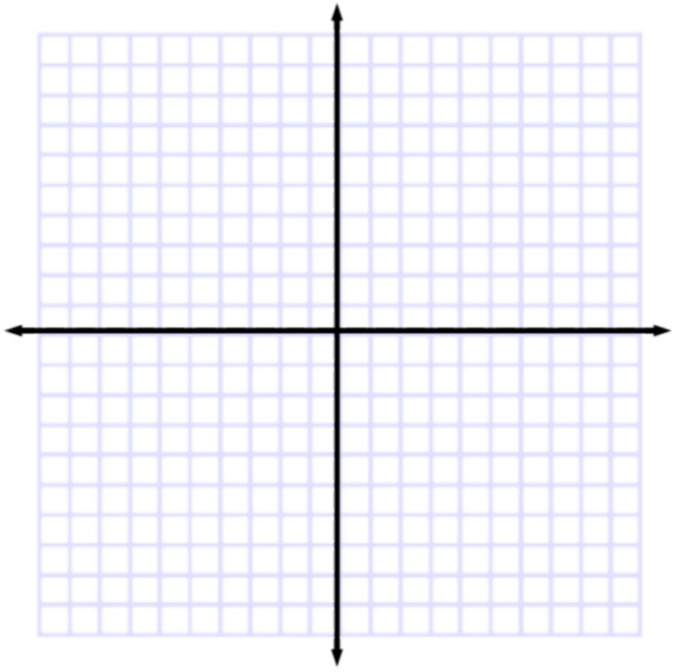
4. Write an equation in ~~slope intercept~~ form for the line that passes through (1,6) and is perp. to the graph of $y = \frac{2}{3}x - 1$.

x y

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

~~parallel~~

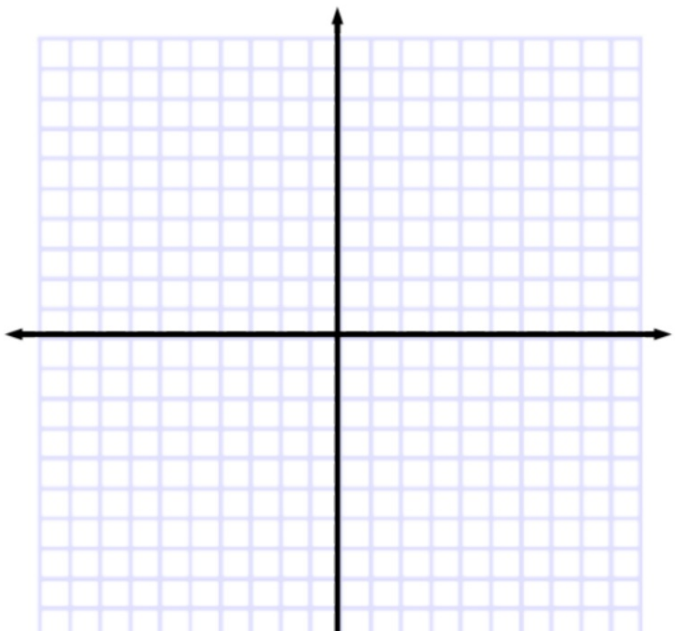
$y - 6 = -\frac{3}{2}(x - 1)$



Eyeball is not enough…

GuidedPractice

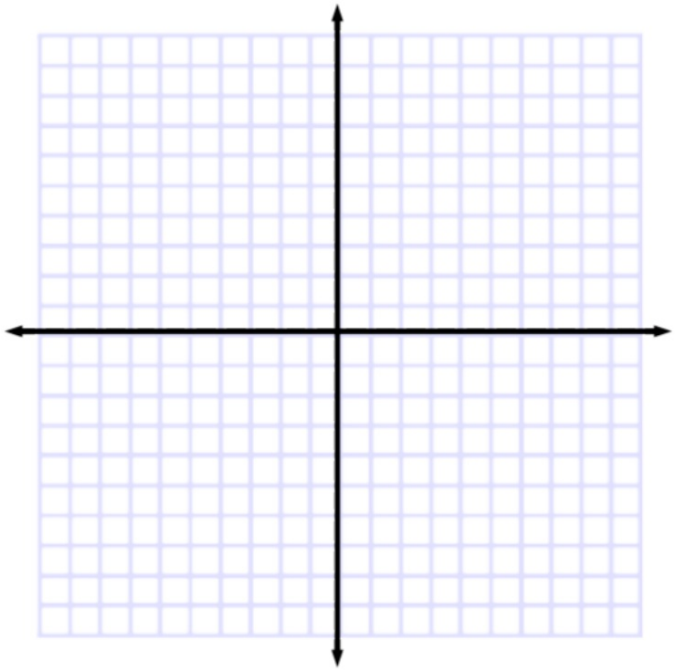
2. CONSTRUCTION On the plans for a treehouse, a beam represented by $\overline{QR}$ has endpoints $Q(-6, 2)$ and $R(-1, 8)$. A connecting beam represented by $\overline{ST}$ has endpoints $S(-3, 6)$ and $T(-8, 5)$. Are the beams perpendicular? Explain.



Example 3 Parallel or Perpendicular Lines

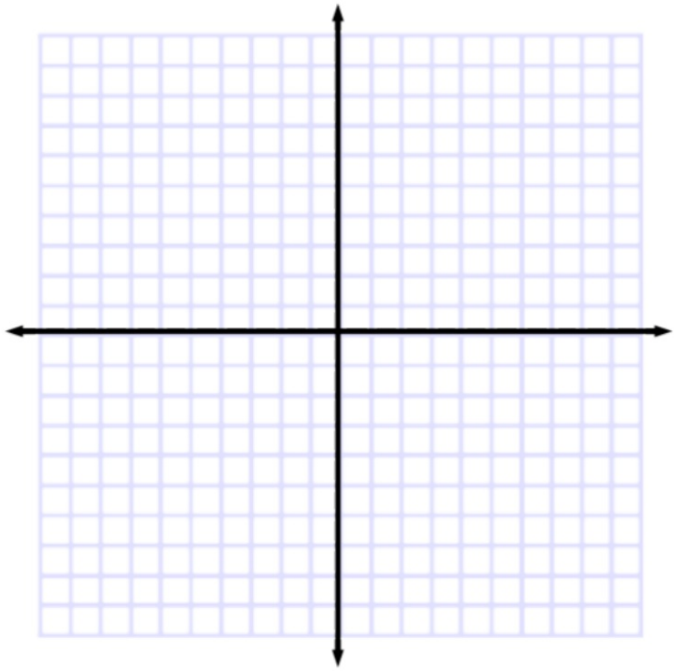
Determine whether the graphs of $y = 5$, $x = 3$, and $y = -2x + 1$ are *parallel* or *perpendicular*. Explain.

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.

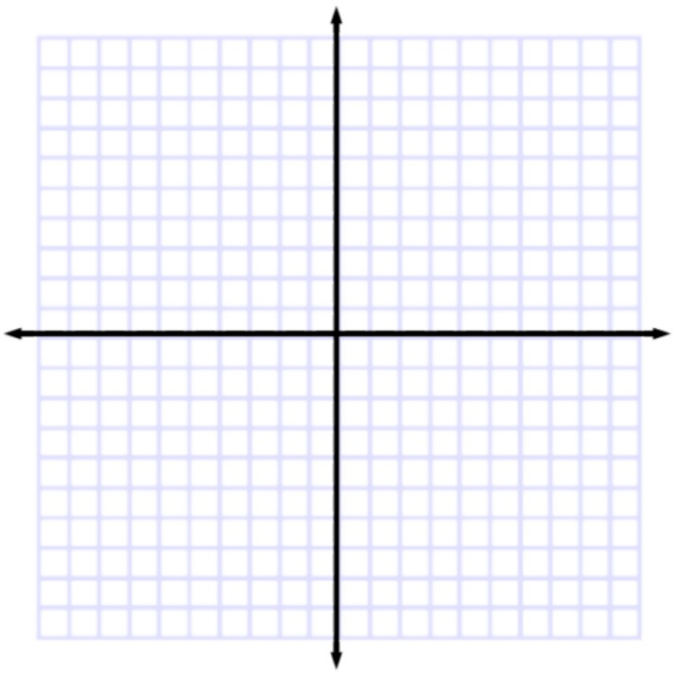
What do we need to know?



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?

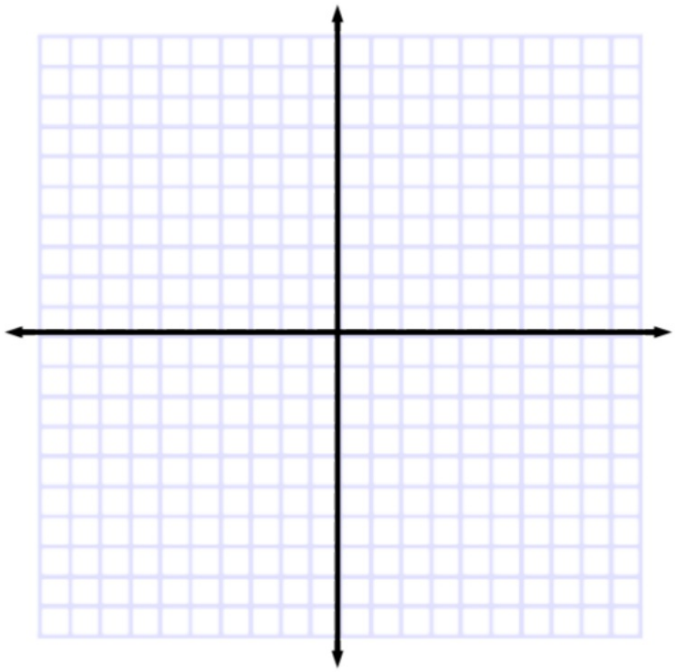


Write an equation in slope-intercept form for the line that passes through the given point and is perpendicular to the graph of the equation.

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

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

What do we need to know?



PT- Slope

$y = \frac{1}{2}x + 6$

$m = -\frac{2}{1} = -2$

$y + 5 = -2(x + 3)$

$y = -\frac{1}{4}x + 2 \quad (7, -1)$

$m = \frac{4}{1} = 4$

$y + 1 = 4(x - 7)$

$y = \frac{2}{5}x + 7 \quad (3, -5)$

$(y - -5) = -\frac{5}{2}(x - 3)$

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

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

Hello

$y = -\frac{1}{4}x - 2 \quad (8, -1)$

$y = -\frac{5}{7}x + 4 \quad (5, -1)$

opp recip.

① perpendicular

① parallel

Same

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