Algebra 1   4.4   SI $y = mx + B$
                               PS $y - y_1 = m(x - x_1)$
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   Slope + (x, y)
vertical
horizontal
∥ parallel   Same slope
⊥ perpendicular   recip. + oppo.
spaghetti lines

1 Parallel Lines

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

All vertical lines are parallel.

If two nonvertical lines in a plane have the same slope, then they are parallel.
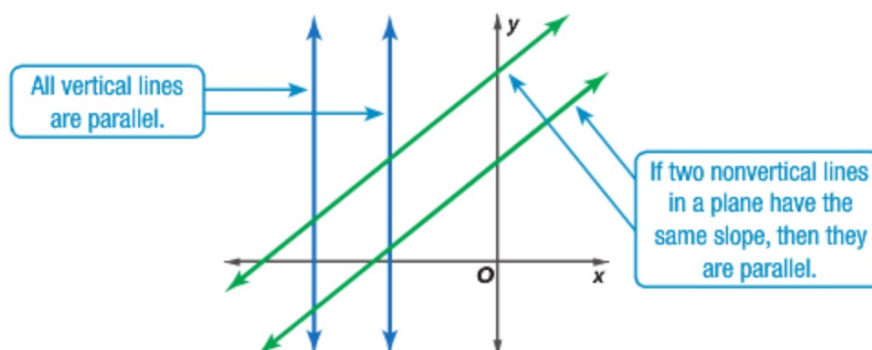
Whiteboards

$y = mx + B$

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

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

$y = \frac{1}{2}x + 2.5$

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

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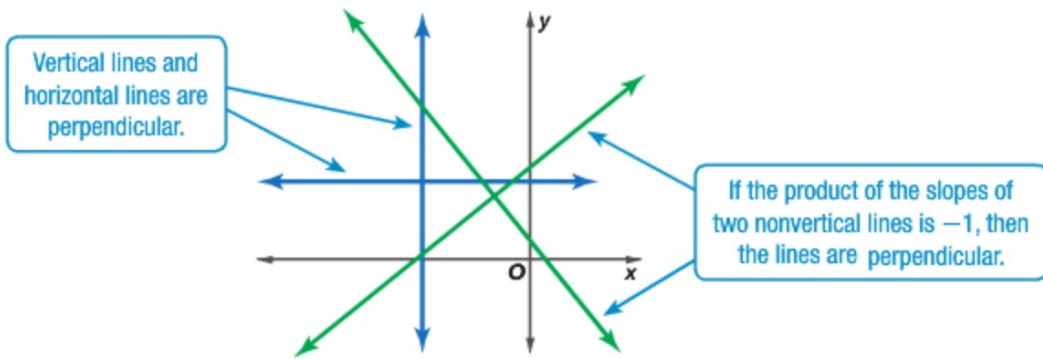
$+\frac{1}{2} \quad +\frac{1}{2}$

$2.5 = B$

$4 = -4 \cdot 0 + B$

$4 = 0 + B$

$4 = B$

$y = -4x + 4$

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

Vertical lines and horizontal lines are perpendicular.

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

Example 3 Parallel or Perpendicular Lines

horiz

vert.

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

$m = -2$

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

$y = 5$ is $\perp$ to $x = 3$

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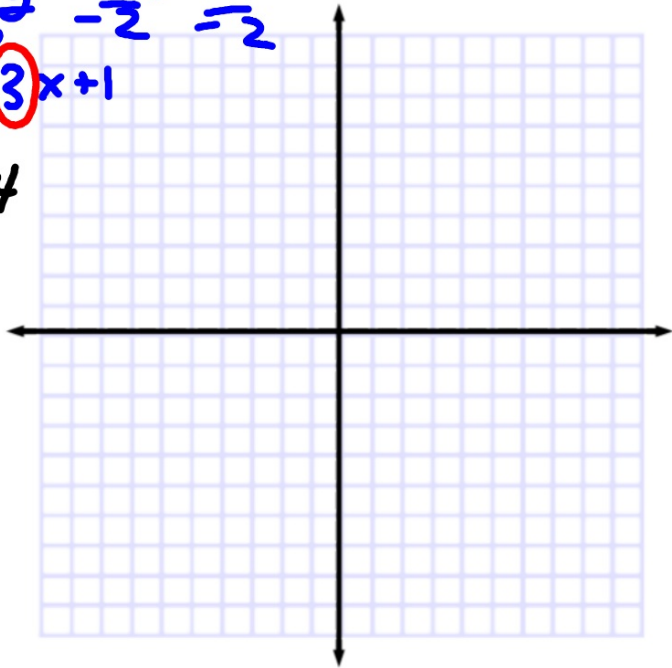
$-6x \qquad -6x$

What do we need to know?

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

$$y = 3x + 1$$

$$6x - 2y = -2 \; // \; y = 3x - 4$$

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

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 $2x + 3y = 12$.
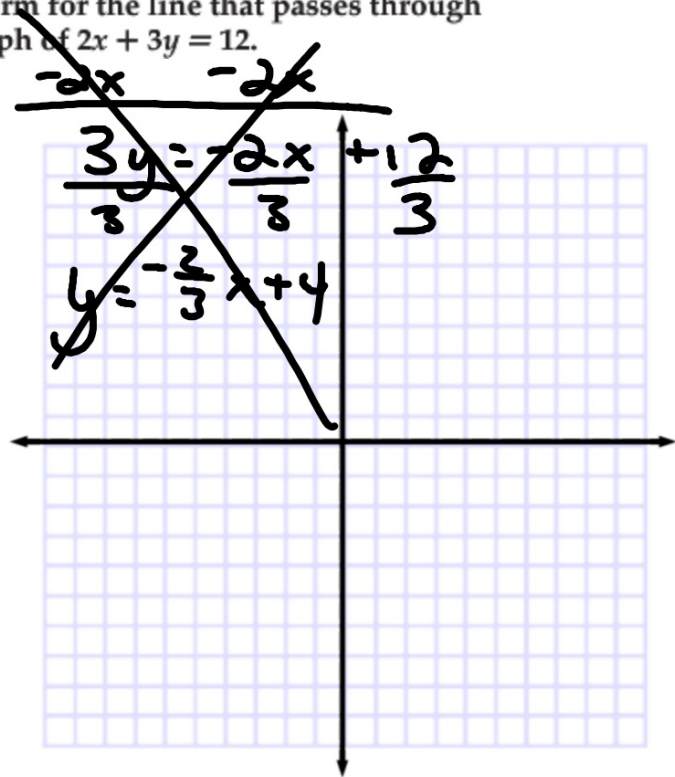
x y

What do we need to know?

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

$$6 = \frac{3}{2} \cdot \frac{-4}{1} + B$$

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

$$B = 12$$

$$-2x \qquad -2x$$

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

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

What do we need to know?

4. Write an equation in slope-intercept form for the line that passes through (4,7) and is perpendicular to the graph of $y = \frac{2}{3} - 1$.
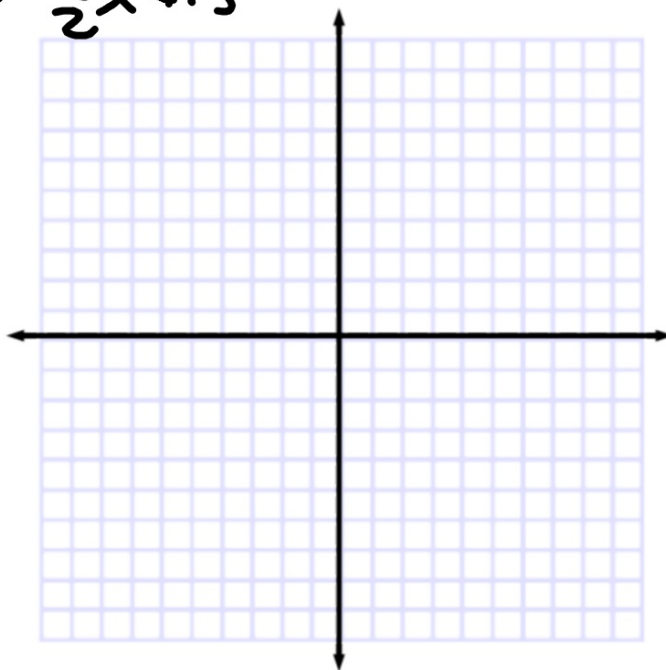
$$y = mx + B \qquad y = -\frac{3}{2}x + 13$$

$$7 = -\frac{3}{2} \cdot \frac{4}{1} + B$$

$$7 = -\frac{12}{2} + B$$

$$7 = -6 + B$$

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?