Date: 10/20/21

Lesson 3.5 Equations of Parallel & Perpendicular Lines

Learning Intent (Target): *Today I will* be able to discover properties of parallel & perpendicular lines.

Success Criteria: *I'll know I'll have it when* I'll be able to use properties about parallel & perpendicular lines to write equations of parallel & perpendicular lines.

Accountable Team Task: *Therefore, I can* practice from interactive flip charts and matching card sort activities.

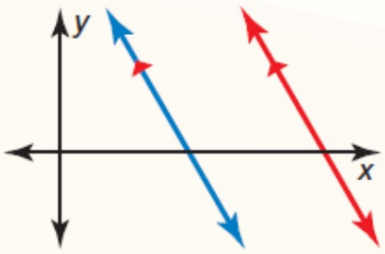
Theorems

Theorem 3.13 Slopes of Parallel Lines

In a coordinate plane, two nonvertical lines are parallel if and only if they have the same slope.

Any two vertical lines are parallel.

Proof p. 439; Ex. 41, p. 444



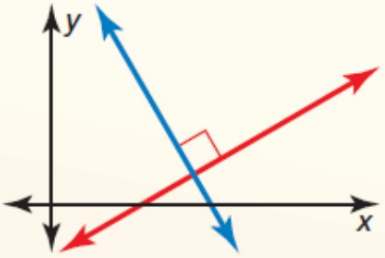
$m_1 = m_2$

Theorem 3.14 Slopes of Perpendicular Lines

In a coordinate plane, two nonvertical lines are perpendicular if and only if the product of their slopes is -1.

Horizontal lines are perpendicular to vertical lines.

Proof p. 440; Ex. 42, p. 444



$m_1 \cdot m_2 = -1$

Write an equation of the line passing through the point (−1, 1) that is parallel to the line $y = 2x - 3$.

SOLUTION

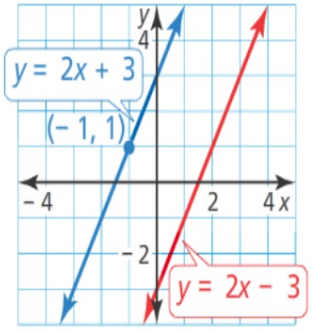
Step 1 Find the slope m of the parallel line. The line $y = 2x - 3$ has a slope of 2. By the Slopes of Parallel Lines Theorem, a line parallel to this line also has a slope of 2. So, $m = 2$.

Step 2 Find the y-intercept b by using $m = 2$ and $(x, y) = (-1, 1)$.

$y = mx + b$	Use slope-intercept form.
$1 = 2(-1) + b$	Substitute for m, x, and y.
$3 = b$	Solve for b.

▶ Because $m = 2$ and $b = 3$, an equation of the line is $y = 2x + 3$. Use a graph to check that the line $y = 2x - 3$ is parallel to the line $y = 2x + 3$.

Check



Write an equation of the line passing through the point (2, 3) that is perpendicular to the line $2x + y = 2$.

SOLUTION

Step 1 Find the slope m of the perpendicular line. The line $2x + y = 2$, or $y = -2x + 2$, has a slope of -2. Use the Slopes of Perpendicular Lines Theorem.

$-2 \cdot m = -1$ The product of the slopes of $\perp$ lines is -1.

$m = \frac{1}{2}$ Divide each side by -2.

Step 2 Find the y-intercept b by using $m = \frac{1}{2}$ and $(x, y) = (2, 3)$.

$y = mx + b$ Use slope-intercept form.

$3 = \frac{1}{2}(2) + b$ Substitute for m, x, and y.

$2 = b$ Solve for b.

▶ Because $m = \frac{1}{2}$ and $b = 2$, an equation of the line is $y = \frac{1}{2}x + 2$. Check that the lines are perpendicular by graphing their equations and using a protractor to measure one of the angles formed by their intersection.

Check