

Lesson 8-1

Example 1

For each line identified by two points, state the slope of a line parallel and the slope of a line perpendicular to it.

a. $I(5, 3)$ and $J(2, 4)$

b. $K(-2, -6)$ and $L(6, -1)$

c. $M(0, 3)$ and $N(-2, 8)$

d. $O(-7, -6)$ and $P(-4, -6)$

Solution

Recall that $m = \frac{y_2 - y_1}{x_2 - x_1}$. The slope of the parallel line is m , and the slope of the perpendicular line is $-\frac{1}{m}$.

	Line	∥ Line	⊥ Line
a.	$\frac{4 - 3}{2 - 5} = \frac{1}{-3} = -\frac{1}{3}$	$-\frac{1}{3}$	3
b.	$\frac{-1 - (-6)}{6 - (-2)} = \frac{5}{8}$	$\frac{5}{8}$	$-\frac{8}{5}$
c.	$\frac{8 - 3}{-2 - 0} = \frac{5}{-2} = -\frac{5}{2}$	$-\frac{5}{2}$	$\frac{2}{5}$
d.	$\frac{-6 - (-6)}{-4 - (-7)} = \frac{0}{3} = 0$	0	undefined

Example 2

Determine if the graph will show parallel or perpendicular lines, or neither.

a. $y = \frac{2}{5}x - 1$

$$y = -\frac{5}{2}x + 4$$

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

$$8x + 2y = 12$$

c. $y = 3x - 9$

$$6x - 9y = 18$$

Solution

a. The lines are perpendicular since their slopes are negative reciprocals.

b. Write the second equation in slope-intercept form to find the slope.

$$8x + 2y = 12$$

$$y = -4x + 6$$

The lines are parallel since they have the same slope, $m = -4$.

c. Write the second equation in slope-intercept form.

$$6x - 9y = 18$$

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

The lines are neither parallel nor perpendicular since $m = 3$ in the first equation and $m = \frac{2}{3}$ in the second equation.

Example 3

Write an equation in slope-intercept form of a line that passes through (6, 5) and is parallel to the line $y = -\frac{1}{3}x + 4$.

Solution

The slope of the line is $-\frac{1}{3}$. Substitute $-\frac{1}{3}$ for m and the point (6, 5) in slope-intercept form to solve for b .

$$5 = -\frac{1}{3}(6) + b$$

$$5 = -2 + b$$

$$7 = b$$

Use the values of m and b to write the equation of the line, $y = -\frac{1}{3}x + 7$.

Example 4

Write an equation in slope-intercept form of a line that passes through (10, 1) and is perpendicular to the line $-4x - 2y = 8$.

Solution

First write the equation in slope-intercept form.

$$-4x - 2y = 8$$

$$y = -2x - 4$$

The slope is -2 . The slope of a line perpendicular to this line is $\frac{1}{2}$. Substitute $\frac{1}{2}$ for m and the point (10, 1) in slope-intercept form.

$$1 = \frac{1}{2}(10) + b$$

$$1 = 5 + b$$

$$-4 = b$$

The equation of the line is $y = \frac{1}{2}x - 4$.