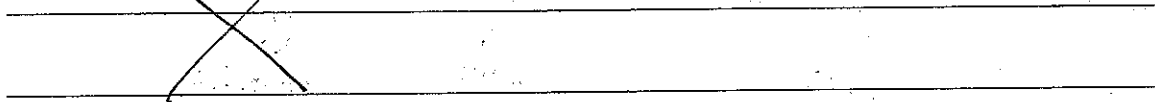


5.5 Write Equations of Parallel and Perpendicular Lines

Goal • Write equations of parallel and perpendicular lines.

VOCABULARY

Converse



Perpendicular lines

Lines that intersect at right angles (90°).

PARALLEL LINES

If two nonvertical lines have the same slope, then they are parallel.

If two nonvertical lines are parallel, then they have the same slope.

converse →

Example 1 - Write an equation of a parallel line

Write an equation of the line that passes through (2, 4) and is parallel to the line $y = 4x + 1$.

Solution

New line has same slope.

Step 1 Identify the slope. The graph of the given equation has a slope of 4. So, the parallel line through (2, 4) has a slope of 4.

Step 2 Find the y-intercept. Use the slope and the given point.

$$m_{||} = 4 \quad \begin{matrix} (2, 4) \\ x \quad y \end{matrix}$$

$$y = mx + b$$

Write slope-intercept form

$$4 = 4(2) + b$$

$$4 = 8 + b$$

$$\begin{matrix} -8 & -8 \\ -4 & = b \end{matrix}$$

Step 3 Write an equation Use $y = mx + b$

$$y = \underline{4x} - 4$$

Substitute 4 for m and -4 for b

6

opposite reciprocal $-\frac{1}{6}$

$-\frac{2}{3}$

PERPENDICULAR LINES

If two nonvertical lines have the slopes that are opposite reciprocals, then the lines are perpendicular.

opp. recip. $\frac{3}{2}$

If two nonvertical lines are perpendicular, then their slopes are opposite reciprocals

Example 2 - Determine parallel or perpendicular lines

if product of slopes = -1 then lines \perp

Determine which of the following lines, if any, are parallel or perpendicular:

Line a: $12x - 3y = 3$

⇒ Line b: $y = 4x + 2$

Line c: $4y + x = 8$

$m = 4$

↓
same slope

↓
opposite reciprocals

Solution

Line a: $12x - 3y = 3$
 $-12x \quad -12x$

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

$y = 4x - 1$

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

Lines a and b are parallel.

Lines a + b are perpendicular to line c.

Line c: $4y + x = 8$
 $-x \quad -x$

$\frac{4y}{4} = \frac{-x + 8}{4}$

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

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

Checkpoint Complete the following exercises.

1. Write an equation of the line that passes through $(-4, 6)$ and is parallel to the line

$y = -3x + 2$

$m = -3$

$y = mx + b$

$6 = -3(-4) + b$

$6 = 12 + b$

$\frac{-12 - 12}{-6} = b$

$m = -3 \quad b = -6$

$y = -3x - 6$

2. Determine which of the following lines, if any, are parallel or perpendicular.

Line a: $4x + y = 2$

Line b: $5y + 20x = 10$

Line c: $8y = 2x + 8$