

3.6

Parallel Lines in the Coordinate Plane

- Goals**
- Find slopes of lines and use slope to identify parallel lines in a coordinate plane.
 - Write equations of parallel lines in a coordinate plane.

Example 1 Finding the Slope of a Line

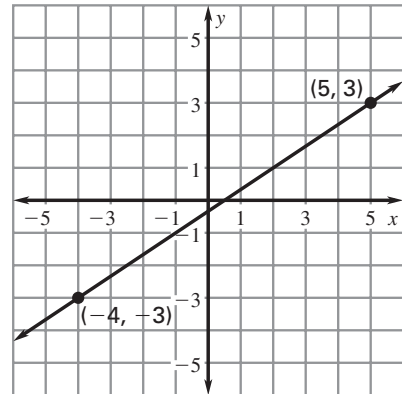
Find the slope of the line that passes through the points $(-4, -3)$ and $(5, 3)$.

Solution

Let $(x_1, y_1) = (-4, -3)$ and $(x_2, y_2) = (5, 3)$.

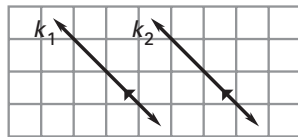
$$\begin{aligned}
 m &= \frac{y_2 - y_1}{x_2 - x_1} \\
 &= \frac{3 - (-3)}{5 - (-4)} \\
 &= \frac{6}{9} = \frac{2}{3}
 \end{aligned}$$

Answer The slope of the line is $\frac{2}{3}$.



POSTULATE 17: 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.



Lines k_1 and k_2 have the same slope.

Example 2 Identifying Parallel Lines

Find the slope of each line. Which lines are parallel?

Solution

Find the slope of j_1 . Line j_1 passes through $(-5, 2)$ and $(-1, 10)$.

$$m_1 = \frac{\boxed{10} - \boxed{2}}{\boxed{-1} - \boxed{-5}} = \frac{\underline{8}}{\underline{4}} = \underline{2}$$

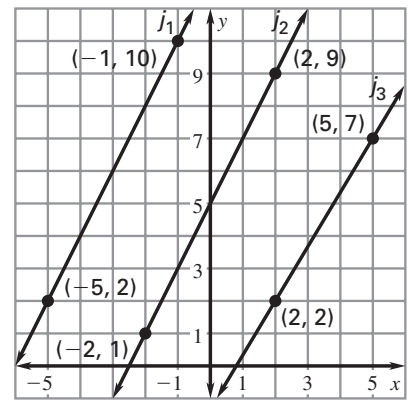
Find the slope of j_2 . Line j_2 passes through $(-2, 1)$ and $(2, 9)$.

$$m_2 = \frac{\boxed{9} - \boxed{1}}{\boxed{2} - \boxed{-2}} = \frac{\underline{8}}{\underline{4}} = \underline{2}$$

Find the slope of j_3 . Line j_3 passes through $(2, 2)$ and $(5, 7)$.

$$m_3 = \frac{\boxed{7} - \boxed{2}}{\boxed{5} - \boxed{2}} = \frac{\underline{5}}{\underline{3}}$$

Answer Compare the slopes. Lines j_1 and j_2 are parallel.

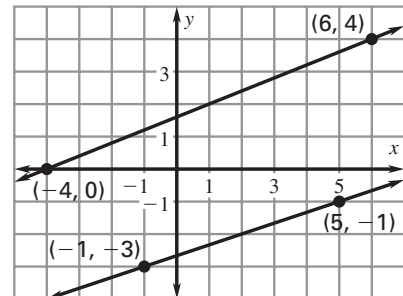


Checkpoint Complete the following exercises.

1. Find the slope of the line that passes through the points $(-2, 5)$ and $(3, 0)$.

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2. Find the slope of each line. Are the lines parallel?



$\frac{2}{5}, \frac{1}{3}$; no

Example 3 Writing an Equation of a Parallel Line

Line k_1 has the equation $y = -2x + 5$.

Line k_2 is parallel to k_1 and passes through the point $(-4, 3)$. Write an equation of k_2 .

Solution

Find the slope of each line.

The slope of k_1 is -2 . Because parallel lines have the same slope, the slope of k_2 is -2 .

Find the y-intercept. Use $(x, y) = (-4, 3)$ and $m = -2$.

$$y = mx + b \quad \text{Write slope-intercept form.}$$

$$3 = -2(-4) + b \quad \text{Substitute values.}$$

$$3 = 8 + b \quad \text{Multiply.}$$

$$-5 = b \quad \text{Subtract 8 from each side.}$$

Answer Because $m = -2$ and $b = -5$, an equation of k_2 is $y = -2x - 5$.

✔ **Checkpoint** Write an equation of the line that passes through point P and is parallel to the line with the given equation.

3. $P(0, -3), y = x + 7$

$$y = x - 3$$

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

$$y = -\frac{3}{2}x + 6$$