

LESSON
3.4**Study Guide**

For use with pages 171–179

GOAL Find and compare slopes of lines.**Vocabulary**

The **slope** (m) of a nonvertical line is the ratio of vertical change (*rise*) to horizontal change (*run*) between any two points on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$

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.

Postulate 18 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.

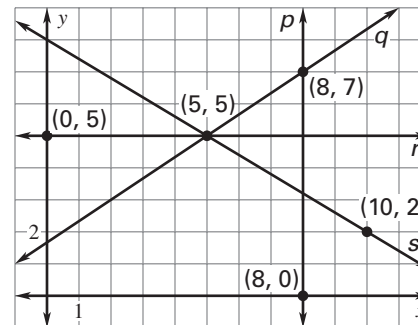
EXAMPLE 1 Find slopes of lines in a coordinate plane

Find the slope of line q and line r .

Solution

$$\text{Slope of line } q: m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 5}{8 - 5} = \frac{2}{3}$$

$$\text{Slope of line } r: m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 5}{5 - 0} = 0$$

**Exercise for Example 1**

- In Example 1, find the slope of line p and line s .

EXAMPLE 2 Identify parallel lines

Find the slope of each line. Is $a \parallel b$?

Solution

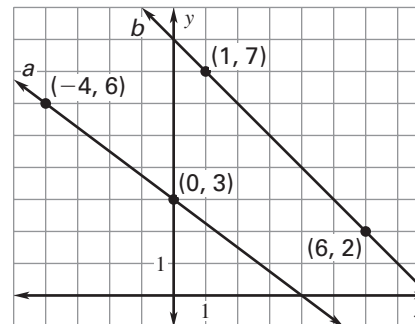
Find the slope of a through $(-4, 6)$ and $(0, 3)$.

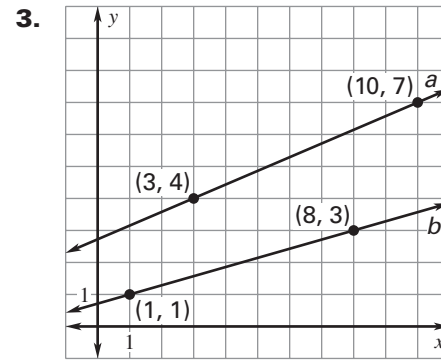
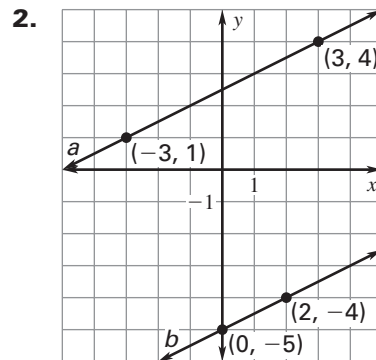
$$m_a = \frac{3 - 6}{0 - (-4)} = -\frac{3}{4}$$

Find the slope of b through $(1, 7)$ and $(6, 2)$.

$$m_b = \frac{2 - 7}{6 - 1} = -1$$

Compare the slopes. Because a and b have different slope, they are not parallel.



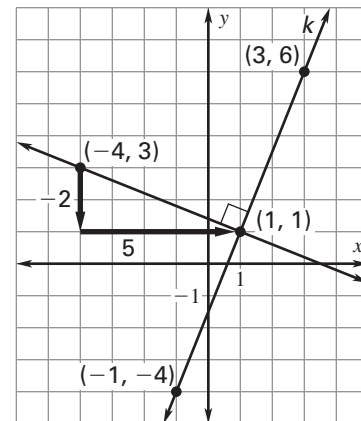
LESSON
3.4**Study Guide** *continued*
For use with pages 171–179**Exercises for Example 2**Find the slope of each line. Is $a \parallel b$?**EXAMPLE 3** Draw a perpendicular lineLine k passes through $(-1, -4)$ and $(3, 6)$. Graph the line perpendicular to k that passes through the point $(-4, 3)$.**Solution****STEP 1** Find the slope m_1 of line k through $(-1, -4)$ and $(3, 6)$.

$$m_1 = \frac{6 - (-4)}{3 - (-1)} = \frac{10}{4} = \frac{5}{2}$$

STEP 2 Find the slope m_2 of a line perpendicular to k . Use the fact that the product of the slopes of two perpendicular lines is -1 .

$$\frac{5}{2} \cdot m_2 = -1$$

$$m_2 = -\frac{2}{5}$$

STEP 3 Use the rise and run to graph the line.**Exercises for Example 3**

- Line j passes through $(-4, 2)$ and $(6, 0)$. Graph the line perpendicular to j that passes through the point $(0, -4)$.
- Line n passes through $(-2, 3)$ and $(5, -1)$. Graph the line perpendicular to n that passes through the point $(-6, -1)$.