NAME ______________________ DATE ____________

8–3 Slope of a Line

Objective: To find the slope of a line.

Vocabulary

Slope If (x_1, y_1) and (x_2, y_2) are *any* two different points on a line,

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{difference between } y\text{-coordinates}}{\text{difference between } x\text{-coordinates}} = \frac{y_2 - y_1}{x_2 - x_1}.$$

Positive slope The slope of a line that rises from left to right is positive.

Negative slope The slope of a line that falls from left to right is negative.

Zero slope A horizontal line has slope 0.

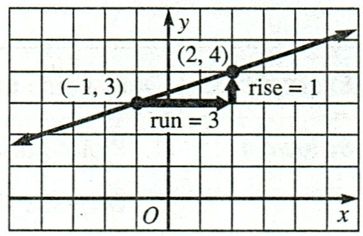
No slope A vertical line has no slope.

Collinear points Points that lie on the same line.

Example 1 Find the slope of the line through $(-1, 3)$ and $(2, 4)$.

Solution Let $(x_1, y_1) = (-1, 3)$ and $(x_2, y_2) = (2, 4)$.

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 3}{2 - (-1)} = \frac{1}{3}$$



Example 2 Find the slope of the line through $(1, -3)$ and $(4, -3)$.

Solution $\text{Slope} = \frac{-3 - (-3)}{4 - 1} = \frac{0}{3} = 0$ The line has slope 0.

Example 3 Find the slope of the line through $(2, -1)$ and $(2, 5)$.

Solution $\text{Slope} = \frac{5 - (-1)}{2 - 2} = \frac{6}{0}$ (undefined) The line has *no* slope.

Find the slope of the line through the given points.

1. $(5, -6), (2, -4)$
2. $(-3, 6), (-5, 4)$
3. $(0, 1), (2, -2)$
4. $(1, 2), (4, 6)$
5. $(2, 1), (8, -2)$
6. $(-1, 5), (0, 0)$
7. $(4, 3), (2, 7)$
8. $(5, 2), (-1, 2)$
9. $(-3, -4), (1, 2)$
10. $(-5, 2), (7, -6)$
11. $(1, 4), (-3, 0)$
12. $(4, 4), (-4, 6)$
13. $(8, -1), (6, 0)$
14. $(3, -1), (-2, 4)$
15. $(7, 4), (7, -4)$

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8–4 The Slope-Intercept Form of a Linear Equation

Objective: To use the slope-intercept form of a linear equation.

Vocabulary

y-intercept The *y*-coordinate of a point where a graph intersects the *y*-axis. Since the point is on the *y*-axis, its *x*-coordinate is 0.

Slope-intercept form of an equation The equation of a line in the form $y = mx + b$, where m is the slope and b is the *y*-intercept.

Parallel lines Lines in the same plane that do not intersect. Lines with the same slope and different *y*-intercepts are parallel.

Example 1 Find the slope and *y*-intercept of each line: **a.** $y = \frac{5}{2}x + 4$ **b.** $y = \frac{5}{2}x$ **c.** $y = 4$

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

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

$y = \frac{5}{2}x + 4$
↑ m ↑ b

The slope is $\frac{5}{2}$ and the *y*-intercept is 4.

b. $y = \frac{5}{2}x$

$y = \frac{5}{2}x + 0$
↑ m ↑ b

The slope is $\frac{5}{2}$ and the *y*-intercept is 0.

c. $y = 4$

$y = 0x + 4$
↑ m ↑ b

The slope is 0 and the *y*-intercept is 4.

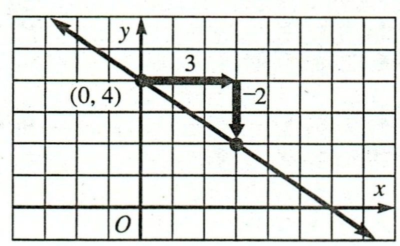
Find the slope and the y-intercept.

1. $y = x - 3$	**2.** $y = 2x + 3$	**3.** $y = -2$	**4.** $y = \frac{1}{3}x + 4$
5. $y = -\frac{1}{2}x$	**6.** $y = -\frac{1}{3}x - 3$	**7.** $y = -2x + 6$	**8.** $y = -4x + 8$
9. $y = -x + 5$	**10.** $y=x - 9$	**11.** $y = 3x - 2$	**12.** $y = 3$

Example 2 Use only the slope and *y*-intercept to graph $y = -\frac{2}{3}x + 4$.

Solution

1. Since the *y*-intercept is 4, plot (0, 4).
2. Since the slope $m = -\frac{2}{3} = \frac{-2}{3} = \frac{\text{rise}}{\text{run}}$, move 3 units to the right of (0, 4) and 2 units down to locate a second point.
3. Draw a line through the points.



Use only the slope and y-intercept to graph each equation. You may wish to verify your graphs on a computer or a graphing calculator.

13. $y = \frac{2}{3}x - 4$	**14.** $y = \frac{3}{4}x - 3$	**15.** $y = -\frac{1}{2}x$	**16.** $y = -\frac{3}{4}x - 1$
17. $y = -x + 3$	**18.** $y = 2x + 1$	**19.** $y = -3$	**20.** $y = 5$