

11-3 Using Slopes and Intercepts

Writing Equations in Slope-Intercept form

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If you know any two points on a line, or two solutions of a linear equation, you can find the slope of the line without graphing. The slope of a line through the points (x_1, y_1) and (x_2, y_2) is as follows:

$$\frac{y_2 - y_1}{x_2 - x_1}$$

In an equation written in **slope-intercept form**, $y = mx + b$, m is the slope and b is the y -intercept.

$$y = mx + b$$

↑ Slope ↑ y -intercept

Helpful Hint

For an equation such as $y = x - 6$, write it as $y = x + (-6)$ to read the y -intercept, -6 .

Additional Example 2A: Using Slope-Intercept Form to Find Slopes and y -intercepts

Write each equation in slope-intercept form, and then find the slope and y -intercept.

A. $2x + y = 3$
 $2x + y = 3$
 $\underline{-2x} \quad \underline{-2x}$ Subtract $2x$ from both sides.
 $y = 3 - 2x$
 Rewrite to match slope-intercept form.
 $y = \underline{-2x} + \underline{3}$ The equation is in slope-intercept form.
 $m = -2$ $b = 3$
 The slope of the line $2x + y = 3$ is -2 , and the y -intercept is 3 .

Additional Example 2B: Using Slope-Intercept Form to Find Slopes and y -intercepts

B. $5y = 3x$
 $5y = 3x$
 $\frac{5y}{5} = \frac{3}{5}x$ Divide both sides by 5 to solve for y .
 $y = \frac{3}{5}x + 0$ The equation is in slope-intercept form.
 $m = \frac{3}{5}$ $b = 0$
 The slope of the line $5y = 3x$ is $\frac{3}{5}$, and the y -intercept is 0 .

Additional Example 2C: Using Slope-Intercept Form to Find Slopes and y-intercepts

C. $4x + 3y = 9$

$4x + 3y = 9$

$-4x$ $-4x$ Subtract $4x$ from both sides.

$3y = 9 - 4x$

Rewrite to match slope-intercept form.

$3y = -4x + 9$

$\frac{3y}{3} = \frac{-4x}{3} + \frac{9}{3}$ Divide both sides by 3.

$y = -\frac{4}{3}x + 3$ The equation is in slope-intercept form.

The slope of the line $4x + 3y = 9$ is $-\frac{4}{3}$, and the y-intercept is 3.

$m = -\frac{4}{3}$ $b = 3$

Try This: Example 2A

Write each equation in slope-intercept form, and then find the slope and y-intercept.

A. $4x + y = 4$

$-4x$ $-4x$ Subtract $4x$ from both sides.

$y = 4 - 4x$

Rewrite to match slope-intercept form.

$y = -4x + 4$ The equation is in slope-intercept form.

$m = -4$ $b = 4$

The slope of the line $4x + y = 4$ is -4 , and the y-intercept is 4.

Try This: Example 2B

B. $7y = 2x$

$7y = 2x$

$\frac{7y}{7} = \frac{2}{7}x$ Divide both sides by 7 to solve for y.

$y = \frac{2}{7}x + 0$ The equation is in slope-intercept form.

$m = \frac{2}{7}$ $b = 0$

The slope of the line $7y = 2x$ is $\frac{2}{7}$, and the y-intercept is 0.

Try This: Example 2C

C. $5x + 4y = 8$

$5x + 4y = 8$

$-5x$ $-5x$ Subtract $5x$ from both sides.

$4y = 8 - 5x$

Rewrite to match slope-intercept form.

$5x + 4y = 8$

$\frac{4y}{4} = \frac{-5x}{4} + \frac{8}{4}$ Divide both sides by 4.

$y = -\frac{5}{4}x + 2$ The equation is in slope-intercept form.

The slope of the line $5x + 4y = 8$ is $-\frac{5}{4}$, and the y-intercept is 2.

$m = -\frac{5}{4}$ $b = 2$

Additional Example 3: Entertainment Application

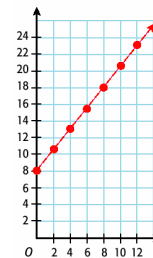
A video club charges \$8 to join, and \$1.25 for each DVD that is rented. The linear equation $y = 1.25x + 8$ represents the amount of money y spent after renting x DVDs. Graph the equation by first identifying the slope and y-intercept.

$y = 1.25x + 8$ The equation is in slope-intercept form.

$m = 1.25$ $b = 8$

Additional Example 3 Continued

The slope of the line is 1.25, and the y-intercept is 8. The line crosses the y-axis at the point (0, 8) and moves up 1.25 units for every 1 unit it moves to the right.



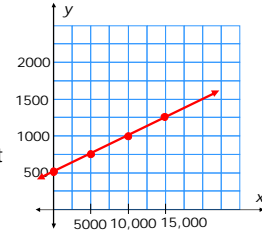
Try This: Example 3

A salesperson receives a weekly salary of \$500 plus a commission of 5% for each sale. Total weekly pay is given by the equation $S = 0.05c + 500$. Graph the equation using the slope and y-intercept.

$y = 0.05x + 500$ *The equation is in slope-intercept form.*
 $m = 0.05$ $b = 500$

Try This: Example 3 Continued

The slope of the line is 0.05, and the y-intercept is 500. The line crosses the y-axis at the point (0, 500) and moves up 0.05 units for every 1 unit it moves to the right.



Additional Example 4: Writing Slope-Intercept Form

Write the equation of the line that passes through (3, -4) and (-1, 4) in slope-intercept form.

Find the slope.

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - (-4)}{-1 - 3} = \frac{8}{-4} = -2 \quad \text{The slope is } -2.$$

Choose either point and substitute it along with the slope into the slope-intercept form.

$$y = mx + b$$

$$4 = -2(-1) + b \quad \text{Substitute } -1 \text{ for } x, 4 \text{ for } y, \text{ and } -2 \text{ for } m.$$

$$4 = 2 + b \quad \text{Simplify.}$$

Additional Example 4 Continued

Solve for b .

$$4 = 2 + b$$

$$\underline{-2} \quad \underline{-2} \quad \text{Subtract 2 from both sides.}$$

$$2 = b$$

Write the equation of the line, using -2 for m and 2 for b .

$$y = -2x + 2$$

Try This: Example 4

Write the equation of the line that passes through (1, 2) and (2, 6) in slope-intercept form.

Find the slope.

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 2}{2 - 1} = \frac{4}{1} = 4 \quad \text{The slope is } 4.$$

Choose either point and substitute it along with the slope into the slope-intercept form.

$$y = mx + b$$

$$2 = 4(1) + b \quad \text{Substitute } 1 \text{ for } x, 2 \text{ for } y, \text{ and } 4 \text{ for } m.$$

$$2 = 4 + b \quad \text{Simplify.}$$

Try This: Example 4 Continued

Solve for b .

$$2 = 4 + b$$

$$\underline{-4} \quad \underline{-4} \quad \text{Subtract 4 from both sides.}$$

$$-2 = b$$

Write the equation of the line, using 4 for m and -2 for b .

$$y = 4x - 2$$