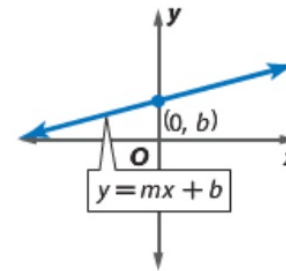


2-4 Writing Linear Equations

KeyConcept Slope-Intercept Form

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

Model



Symbols

$$y = mx + b$$

slope $\xrightarrow{\quad}$ m \quad b $\xrightarrow{\quad}$ y -intercept

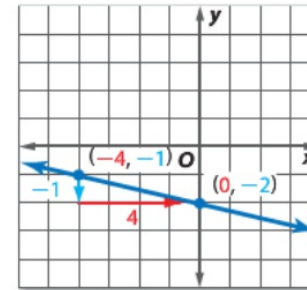
Example 1 Write an Equation in Slope-Intercept Form

Write an equation in slope-intercept form for the line.

The graph intersects the y -axis at -2 . So $b = -2$.

Step 1 Find the slope.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} && \text{Slope Formula} \\ &= \frac{-2 - (-1)}{0 - (-4)} && (x_1, y_1) = (-4, -1), (x_2, y_2) = (0, -2) \\ &= \frac{-1}{4} \text{ or } -\frac{1}{4} && \text{Simplify.} \end{aligned}$$



Step 2 Substitute the values into the slope-intercept equation.

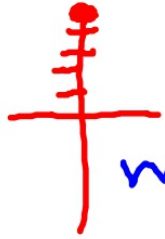
$$\begin{aligned} y &= mx + b && \text{Slope-intercept form} \\ y &= -\frac{1}{4}x - 2 && m = -\frac{1}{4}, b = -2 \end{aligned}$$

► **Guided Practice** 2A. $y = \frac{1}{2}x + 2$ 2B. $y = -3x - 7$

Write an equation in slope-intercept form for the line described.

2A. passes through (2, 3); $m = \frac{1}{2}$

2B. passes through (-2, -1); $m = -3$



$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 3}{0 - (-2)} = \frac{-2}{2} = -1$$

Check Your Understanding

 = Step-by-Step Solutions begin on page R14.



Example 1 Write an equation in slope-intercept form for the line described.

1. slope 1.5, passes through (0, 5)
 $y = 1.5x + 5$

2. passes through (-2, 3) and (0, 1) $y = -x + 1$

Example 2 3. passes through (3, 5), $m = -2$
 $y = -2x + 11$

4. passes through (-8, -2); $m = \frac{5}{2}$ $y = \frac{5}{2}x + 18$

$$y = mx + b$$

$$5 = (-2)(3) + b$$

$$5 = -6 + b$$

$$\begin{array}{r} +6 \\ \hline 11 = b \end{array}$$



Guided Practice

3. Which is an equation of the line that passes through (4, -9) and (2, -4)? **F**

F $y = -\frac{5}{2}x + 1$

H $y = -\frac{2}{5}x + \frac{37}{5}$

G $y = -\frac{5}{2}x - 1$

J $y = -\frac{2}{5}x - \frac{37}{5}$

$$\frac{11 - (-1)}{-9}$$

Example 3

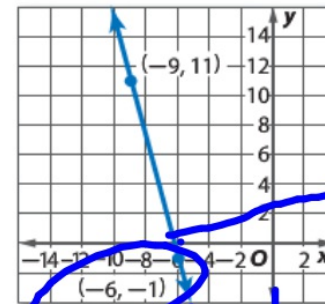
5. **MULTIPLE CHOICE** Which is an equation of the line? **A**

A $y = -4x - 25$

B $y = -\frac{2}{3}x - 5$

~~C $y = \frac{4}{5}x + \frac{29}{25}$~~

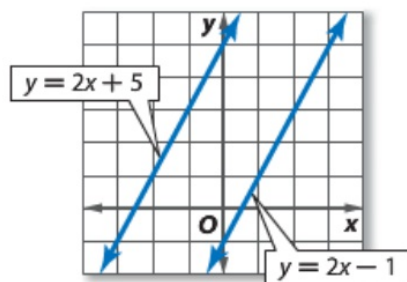
~~D $y = \frac{4}{5}x - 5$~~



KeyConcept Parallel and Perpendicular Lines

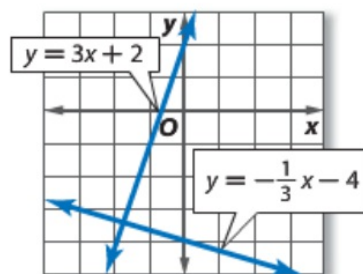
Parallel Lines

Two nonvertical lines are **parallel** if and only if they have the same slope. All vertical lines are parallel.



Perpendicular Lines

Two nonvertical lines are **perpendicular** if and only if the product of the slopes is -1 . Vertical lines and horizontal lines are perpendicular.



Example 4 Write an Equation of a Parallel or Perpendicular Line

Write an equation in slope-intercept form for the line that passes through $(5, -6)$ and is perpendicular to the line with equation $y = -\frac{3}{2}x + 7$.

The slope of the given line is $-\frac{3}{2}$. Because the slopes of perpendicular lines are opposite reciprocals, the slope of the line perpendicular to the given line is $\frac{2}{3}$.

Use the point-slope form and the ordered pair $(5, -6)$.

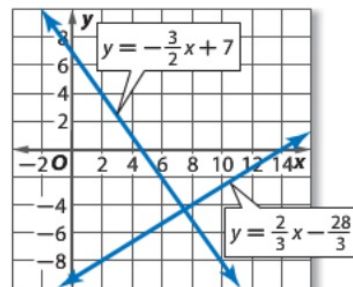
$$y - y_1 = m(x - x_1) \quad \text{Point-slope form}$$

$$y - (-6) = \frac{2}{3}(x - 5) \quad (x_1, y_1) = (5, -6) \text{ and } m = \frac{2}{3}$$

$$y + 6 = \frac{2}{3}x - \frac{10}{3} \quad \text{Distributive Property}$$

$$y = \frac{2}{3}x - \frac{28}{3} \quad \text{Subtract 6 from each side and simplify.}$$

CHECK Graph both equations to verify the solution.



Example 4

CCSS PERSEVERANCE Write an equation in slope-intercept form for the line that satisfies each set of conditions.

- 6. passes through $(-9, -3)$, perpendicular to $y = -\frac{5}{3}x - 8$ $y = 0.6x + 2.4$
- 7. passes through $(4, -10)$, parallel to $y = \frac{7}{8}x - 3$ $y = \frac{7}{8}x - \frac{27}{2}$

⑥ $y = -\frac{3}{5}x - 8$

negative reciprocal!

perpendicular
 $\rightarrow m = \frac{3}{5}$

$$\begin{aligned} & -3 + \frac{27}{5} \\ & -\frac{15}{5} + \frac{27}{5} \\ & = \frac{12}{5} \end{aligned}$$

$$\begin{aligned} -3 &= \left(\frac{3}{5}\right)\left(-9\right) + b \\ y &= mx + b \end{aligned}$$

then solve!

Example 1 Write an equation in slope-intercept form for the line described.

10. $y = -\frac{6}{5}x + 8$ 8. slope 3, passes through (0, -2) $y = 3x - 2$ 9. slope $-\frac{1}{2}$, passes through (0, 5) $y = -\frac{1}{2}x + 5$
10. slope $-\frac{6}{5}$, passes through (0, 8) 11. slope $\frac{9}{2}$, passes through $(0, -\frac{13}{2})$ $y = 4.5x - 6.5$

- Example 2** 12. slope -2, passes through (-3, 14) 13. slope 4, passes through (6, 9) $y = 4x - 15$
14. slope $\frac{3}{5}$, passes through (-6, -8) $y = \frac{3}{5}x - \frac{22}{5}$ 15. slope $-\frac{1}{4}$, passes through (12, -4) $y = -\frac{1}{4}x - 1$

12. $y = -2x + 8$

16. **PART-TIME JOB** Each week, Carmen earns a base pay of \$15 plus \$0.17 for every pamphlet that she delivers. Write an equation that can be used to find how much Carmen earns each week. How much will she earn the week that she delivers 300 pamphlets? $y = 0.17x + 15$; \$66

Example 3 Write an equation of the line passing through each pair of points. 17–22. See margin.

17. (-2, -6), (4, 6) 18. (-8, -5), (-3, 10) 19. (-4, 12), (-2, -4)
20. (4.6, 3.4), (2.2, 2.8) 21. (5.5, 0.6), (1.1, 2.8) 22. (-25, -16), (-29, 12)

Find "m" AND "b"! ↗

Example 4

CCSS PERSEVERANCE Write an equation in slope-intercept form for the line that satisfies each set of conditions.

23. passes through (4, 2), perpendicular to $y = -2x + 3$ $y = \frac{1}{2}x$
24. passes through (-6, -6), parallel to $y = \frac{4}{3}x + 8$ $y = \frac{4}{3}x + 2$
25. passes through (12, 0), parallel to $y = -\frac{1}{2}x - 3$ $y = -\frac{1}{2}x + 6$
26. passes through (10, 2), perpendicular to $y = 4x + 6$ $y = -0.25x + 4.5$

Additional Answers

17. $y = 2x - 2$
18. $y = 3x + 19$
19. $y = -8x - 20$
20. $y = 0.25x + 2.25$
21. $y = -0.5x + 3.35$
22. $y = -7x - 191$

At this time, you should notice that there were a few steps used to get the answers for these problems. Just as a reminder, the problems that I do in class is demonstrating what I expect to see when it comes to the work shown in your homework. If I only see answers when I check it, which was just given to you a moment ago, *that won't count as work being done.*