2.4 – Write Equations of Lines

Writing an equation of a line:

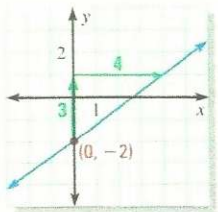
Given slope m and y-intercept b — Use the slope-intercept form

$$y = mx + b$$

Given slope m and a point (x_1, y_1) — Use the point-slope form

$$(y - y_1) = m(x - x_1)$$

Example 1 Write an equation of the line shown



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

$b = -2$

$y = \frac{3}{4}x - 2$

Example 2 Write an equation of the line that passes through (5, 4) and has a slope of -3

$(y - 4) = -3(x - 5)$

$y - 4 = -3x + 15$

$+4 \quad +4$

$y = -3x + 19$

Example 3 Write an equation of the line that passes through (-2,3) and is perpendicular to the line $y = -4x + 1$

$m = -4 \quad m_1 = \frac{1}{4}$ perpendicular slopes are opposite reciprocals

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

$y - 3 = \frac{1}{4}x + \frac{1}{2}$

$y = \frac{1}{4}x + \frac{1}{2} + \frac{6}{2}$

$y = \frac{1}{4}x + \frac{7}{2}$

$3 = \frac{6}{2}$

Example 4 Writhe an equation of the line that passes through (5, -2) and (2, 10)

$m = \frac{10 + 2}{2 - 5} = \frac{12}{-3} = -4$

$y + 2 = -4(x - 5)$ ← OR → $y - 10 = -4(x - 2)$

$y = -4x + 18$ $\qquad$ $y = -4x + 18$

HW: 3-35 odd

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EXAMPLE 1 on p. 98 for Exs. 3–8

SLOPE-INTERCEPT FORM Write an equation of the line that has the given slope and y-intercept.

3. $m = 0, b = 2$
4. $m = 3, b = -4$
5. $m = 6, b = 0$
6. $m = \frac{2}{3}, b = 4$
7. $m = -\frac{5}{4}, b = 7$
8. $m = -5, b = -1$

EXAMPLE 2 on p. 99 for Exs. 9–19

POINT-SLOPE FORM Write an equation of the line that passes through the given point and has the given slope.

9. $(0, -2), m = 4$
10. $(3, -1), m = -3$
11. $(-4, 3), m = 2$
12. $(-5, -6), m = 0$
13. $(8, 13), m = -9$
14. $(12, 0), m = \frac{3}{4}$
15. $(7, -3), m = -\frac{4}{7}$
16. $(-4, 2), m = \frac{3}{2}$
17. $(9, -5), m = -\frac{1}{3}$

ERROR ANALYSIS *Describe* and correct the error in writing an equation of the line that passes through the given point and has the given slope.

18. $(-4, 2), m = 3$

$$y - y_1 = m(x - x_1)$$
$$y - 2 = 3(x - 4)$$
$$y - 2 = 3x - 12$$
$$y = 3x - 10$$

19. $(5, 1), m = -2$

$$y - y_1 = m(x - x_1)$$
$$y - 5 = -2(x - 1)$$
$$y - 5 = -2x + 2$$
$$y = -2x + 7$$

EXAMPLE 3 on p. 99 for Exs. 20–26

PARALLEL AND PERPENDICULAR LINES Write an equation of the line that passes through the given point and satisfies the given condition.

20. $(-3, -5)$; parallel to $y = -4x + 1$
21. $(7, 1)$; parallel to $y = -x + 3$
22. $(2, 8)$; parallel to $y = 3x - 2$
23. $(4, 1)$; perpendicular to $y = \frac{1}{3}x + 3$
24. $(-6, 2)$; perpendicular to $y = -2$
25. $(3, -1)$; perpendicular to $y = 4x + 1$

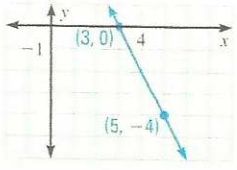
26. ★ **MULTIPLE CHOICE** What is an equation of the line that passes through $(1, 4)$ and is perpendicular to the line $y = 2x - 3$?

(A) $y = 2x + 2$ (B) $y = \frac{1}{2}x + \frac{7}{2}$ (C) $y = -\frac{1}{2}x + \frac{9}{2}$ (D) $y = -\frac{1}{2}x + 4$

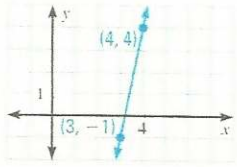
EXAMPLE 4 on p. 100 for Exs. 27–38

VISUAL THINKING Write an equation of the line.

27.



28.



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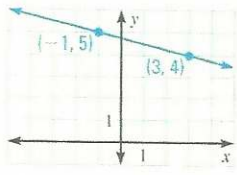

WRITING EQUATIONS Write an equation of the line that passes through the given points.

30. $(-1, 3), (2, 9)$
31. $(4, -1), (6, -7)$
32. $(-2, -3), (2, -1)$
33. $(0, 7), (3, 5)$
34. $(-1, 2), (3, -4)$
35. $(-5, -2), (-3, 8)$
36. $(15, 20), (-12, 29)$
37. $(3.5, 7), (-1, 20.5)$
38. $(0.6, 0.9), (3.4, -2.6)$