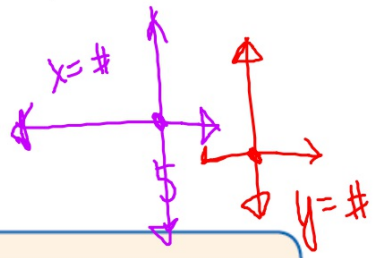
Lesson 3 - 6
Lines in the Coordinate Plane

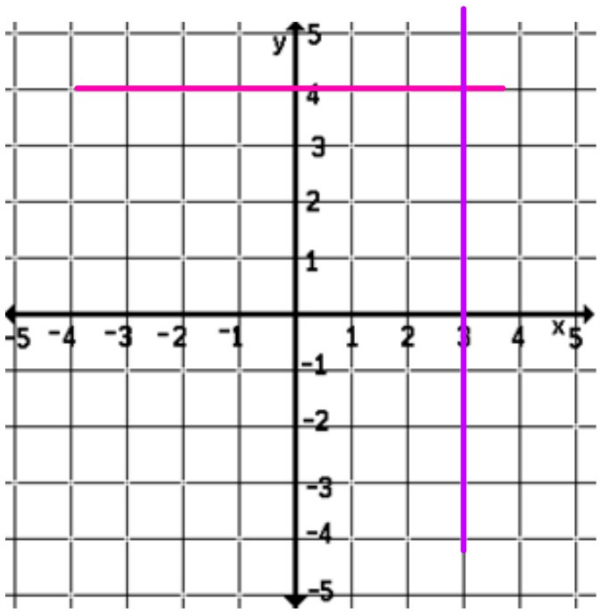


Forms of the Equation of a Line

FORM	EXAMPLE
The **point-slope form** of a line is $y - y_1 = m(x - x_1)$, where m is the slope and (x_1, y_1) is a given point on the line.	$y - 3 = 2(x - 4)$ $m = 2$, $(x_1, y_1) = (3, 4)$
The **slope-intercept form** of a line is $y = mx + b$, where m is the slope and b is the y-intercept.	$y = 3x + 6$ $m = 3$, $b = 6$
The equation of a vertical line is $x = a$, where a is the x-intercept.	$x = 5$
The equation of a horizontal line is $y = b$, where b is the y-intercept.	$y = 2$

Remember!

A line with y-intercept b contains the point $(0, b)$.
A line with x-intercept a contains the point $(a, 0)$.



Write the equation of a line, in slope-intercept form, with slope of 4, that contains the point (-1, 3)

Using Point-Slope Form

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

$y - 3 = 4(x - (-1))$

$y - 3 = 4(x + 1)$

$y - 3 = 4x + 4$

$y = 4x + 7$

Using Slope-Intercept Form

$y = mx + b$

$3 = 4(-1) + b$

$3 = -4 + b$

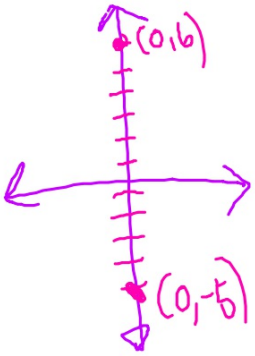
$b = 7$

$y = 4x + 7$

Write the equation of each line in slope-intercept form.

1. The line with slope 3 that passes through (0, 6)

$m = 3$



$y = mx + b$

$y = 3x + 6$

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2. The line with slope -4 that passes through $(0, -5)$

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

$y = -4x - 5$

Write the equation of each line in slope-intercept form.

Write an equation for the line containing (8,5) and (11,14)

$m = \frac{14-5}{11-8} = \frac{9}{3} = 3$

$y = mx + b$

$5 = 3 \cdot 8 + b$

24

$-19 = b$

$y = 3x + (-19)$

(-5,9) and (-4,7)

$m = \frac{7-9}{-4-(-5)} = \frac{-2}{1} = -2$

m

$y = -2x + (-1)$

$9 = (-2)(-5) + b$

$9 = 10 + b$

$-1 = b$

Write the equation of each line in slope-intercept form.

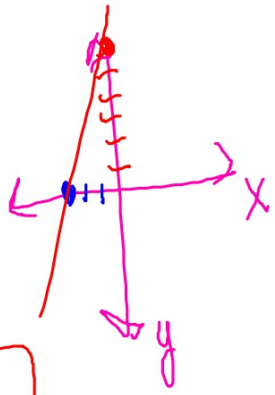
A line with x-intercept of -3 and y-intercept of 6

(-3,0)

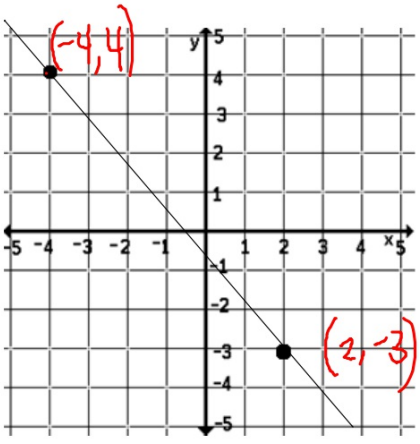
(0,6)

$\frac{6-0}{0-(-3)} = \frac{6}{3} = 2$

m

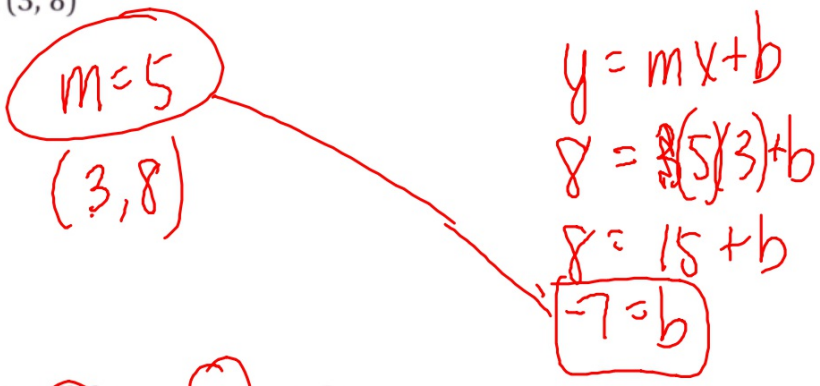


$y = 2x + 6$



Write the equation of each line in slope-intercept form.

5. The line parallel to $y = 5x + 1$ that passes through $(3, 8)$



6. The line parallel to $y = -3x - 2$ that passes through $(-2, 7)$

Write the equation of each line in slope-intercept form.

7. The line that passes through $(-1, 0)$ and is parallel to the line through $(0, 1)$ and $(2, -3)$

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

8. The line that passes through $(3, 5)$ and is parallel to the line through $(3, 3)$ and $(-3, -1)$

Write the equation of each line in slope-intercept form.

9. The line parallel to $x - 3y = -12$ that passes through $(-3, 4)$

solve for y

12. The line perpendicular to $y = \frac{1}{2}x + 1$ that passes through $(1, 4)$

$m = -2$

Write the equation of each line in slope-intercept form.

13. The line perpendicular to $y = -x + 2$ that passes through $(-1, -7)$

16. The line perpendicular to $2y = x + 5$ that passes through $(2, 1)$

$\frac{2y}{2} = \frac{x}{2} + \frac{5}{2}$

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

$-\frac{2}{1}$

18. Error Analysis A student was asked to find the equation of the line perpendicular to $y - 2x = 1$ that passes through the point $(4, 3)$. The student's work is shown at right. Explain the error and give the correct equation.

The given line has slope -2, so the required line has slope $\frac{1}{2}$.

$y - y_1 = m(x - x_1)$	*Use point-slope form.*
$y - 3 = \frac{1}{2}(x - 4)$	*Substitute for m, x_1, y_1.*
$y - 3 = \frac{1}{2}x - 2$	*Distributive Property*
$y = \frac{1}{2}x + 1$	*Add 3 to both sides.*

19. Are the lines given by the equations $-4x + y = 5$ and $-x + 4y = 12$ parallel, perpendicular, or neither? Why?

Lesson Quiz

Write the equation of each line in slope intercept form

A horizontal line through (3, 7)

The line that contains (-3, 0) and (4, -7)

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the line with x-intercept -2 and y-intercept

-1 in slope-intercept form

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Write the equation of each line in the given form.

13. the line through $(0, -2)$ and $(4, 6)$ in point-slope form

14. the line through $(5, 2)$ and $(-2, 2)$ in slope-intercept form

15. the line through $(6, -4)$ with slope $\frac{2}{3}$ in point-slope form

Write the equation of each line in slope-intercept form. Then graph the line.

24. through $(-6, 2)$ and $(3, 6)$

25. horizontal line through $(2, 3)$

26. through $(5, -2)$ with slope $\frac{2}{3}$

27. x-intercept 4, y-intercept -3

Determine whether the lines are perpendicular.

33. $y = 3x - 5$, $y = -3x + 1$

34. $y = -x + 1$, $y = x + 2$

Multi-Step **Given the equation of the line and point P not on the line, find the equation of a line parallel to the given line and a line perpendicular to the given line through the given point.**

37. $y = 3x + 7$, $P(2, 3)$

38. $y = -2x - 5$, $P(-1, 4)$