

Warm Up:

Write each function in slope-intercept form.

1. $4x + y = 8$

$$y = 8 - 4x$$

2. $-y = 3x$

$$y = -3x$$

3. $2y = 10 - 6x$

$$y = 5 - 3x$$

P. 101 #21

P. 110 #32

Get a half sheet of paper out

Objectives

Use slope-intercept form and point-slope form to write linear functions.

Write linear functions to solve problems.

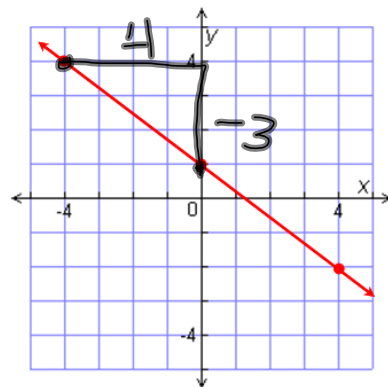
We will start by writing an equation when given a graph. To do this we need to identify a few items.

- 1) Find the y-intercept, keep that y-value.
- 2) Find the slope (remember rise over run)
- 3) Put into slope-intercept form $y = mx + b$
The slope goes in for m and y-intercept for b



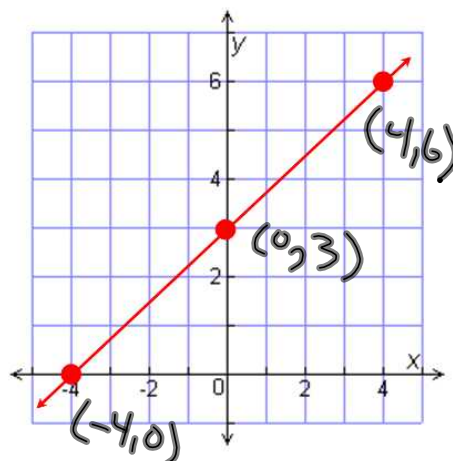
Write the equation of the graphed line in slope-intercept form.

$$\begin{aligned}
 &b \text{ y-int: } 1 \\
 &m \text{ Slope: } -\frac{3}{4} \\
 &y = mx + b \\
 &y = -\frac{3}{4}x + 1
 \end{aligned}$$



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

$$\begin{aligned} y\text{-int: } 3 \\ \text{slope: } \frac{3}{4} \\ y = \frac{3}{4}x + 3 \end{aligned}$$



2-4 Writing Linear Functions

Notice that for two points on a line, the rise is the differences in the y -coordinates, and the run is the differences in the x -coordinates. Using this information, we can define the slope of a line by using a formula.

Slope Formula

WORDS	ALGEBRA	GRAPH
Given two points on a line, the slope is the ratio of the difference in the y -values to the difference in the corresponding x -values, or rise over run.	The slope of the line containing (x_1, y_1) and (x_2, y_2) is $m = \frac{y_2 - y_1}{x_2 - x_1}$	

To find the slope when given points,
label your points and use the formula.
Remember keep the points in the same
order!!!

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

x_1, y_1

x_2, y_2

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

$$\frac{-5 - 1}{2 - (-1)} = \frac{-6}{3} = -2$$

Find the slope of the line.

x	^{x₁} 4	^{x₂} 8	12	16
y	2	5	8	11

^{y₁} ^{y₂}

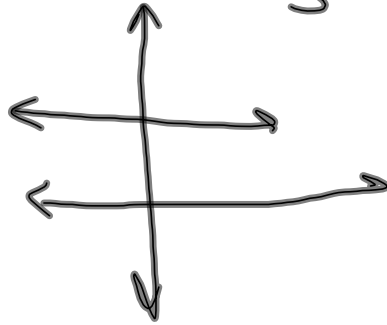
$$\frac{5-2}{8-4} = \frac{3}{4}$$

Find the slope of the line.

x	-6	-4	-2
y	-3	-1	1

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

$$\frac{-5 - -5}{-3 - 2} = \frac{0}{-5} = 0$$



Pick two points and find the slope between those two points.

2-4 Writing Linear Functions

Because the slope of line is constant, it is possible to use any point on a line and the slope of the line to write an equation of the line in **point-slope form**.

Point-Slope Form

The equation of a line with a slope of m and the point (x_1, y_1) is

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

This takes a few steps:

- 1) Find the slope
- 2) Plug the slope and one point in for the equation.
- 3) Solve for y to get back to slope-intercept form.

In slope-intercept form, write the equation of the line that contains the points in the table.

x	x_1 -8	-4	4	x_2 8
y	y_1 -5	-3.5	-0.5	y_2 1

$$m = \frac{1 - (-5)}{8 - (-8)} = \frac{6}{16} = \frac{3}{8}$$

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

$$y - 1 = \frac{3}{8}(x - 8)$$

$$y - 1 = \frac{3}{8}x - 3$$

$$y = \frac{3}{8}x - 2$$

Write the equation of the line in slope-intercept form with slope -5 through (1, 3).

$$y - 3 = -5(x - 1)$$

$$y - 3 = -5x + 5$$

$$y = -5x + 8$$

The table shows the rents and selling prices of properties from a game.

Express the rent as a function of the selling price.

Selling Price x (\$)	Rent y (\$)
75	9
90	12
160	26
250	44

$$m = \frac{3}{15} = \frac{1}{5}$$

$$y - 9 = \frac{1}{5}(x - 75)$$

$$y - 9 = \frac{1}{5}x - 15$$

$$+9 \quad +9$$

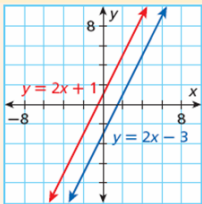
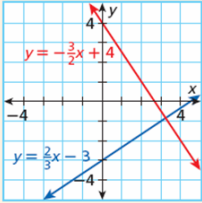
$$y = \frac{1}{5}x - 6$$

(75, 9)

Use those same two points from before.
Find the line between them in slope-intercept form.

2-4 Writing Linear Functions

Parallel and Perpendicular Lines

WORDS	GRAPH	ALGEBRA
Parallel Lines If both slopes are defined, the slopes of parallel lines are equal. The slopes of parallel vertical lines are undefined.		$y_1 = 2x + 1$, so $m_1 = 2$ $y_2 = 2x - 3$ so $m_2 = 2$ $m_1 = m_2$ $2 = 2$
Perpendicular Lines If both slopes are defined, the slopes of perpendicular lines are opposite reciprocals. Their product is -1 . A vertical line and a horizontal line are perpendicular.		$y_1 = -\frac{3}{2}x + 4$, so $m_1 = -\frac{3}{2}$ $y_2 = \frac{2}{3}x - 3$, so $m_2 = \frac{2}{3}$ $(m_1)(m_2) = -1$ $\left(-\frac{3}{2}\right)\left(\frac{2}{3}\right) = -1$

Holt Algebra 2

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- To find parallel or perpendicular:
- 1) Find the slope
 - 2) Then either keep the slope for parallel or go opposite reciprocal for perpendicular.
 - 3) Use the point-slope formula to find the line.

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

parallel to $y = 1.8x + 3$ and through $(5, 2)$

$$\begin{aligned}
 m &= 1.8 & y - y_1 &= m(x - x_1) \\
 & & y - 2 &= 1.8(x - 5) \\
 & & y - 2 &= 1.8x - 9 \\
 & & +2 & \quad +2 \\
 & & y &= 1.8x - 7
 \end{aligned}$$

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

perpendicular $y = -\frac{3}{2}x - 1$ to and through $(9, -2)$

$$\begin{aligned}
 (9, -2) & & y - -2 &= \frac{2}{3}(x - 9) \\
 m = \frac{2}{3} & & y + 2 &= \frac{2}{3}x - 6 \\
 & & y &= \frac{2}{3}x - 8
 \end{aligned}$$

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

parallel to $y = 5x - 3$ and through $(1, 4)$

$$\begin{aligned} m &= 5 & y - y_1 &= m(x - x_1) \\ (1, 4) & & y - 4 &= 5(x - 1) \\ & & y - 4 &= 5x - 5 \\ & & +4 & \quad +4 \\ & & y &= 5x - 1 \end{aligned}$$

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

perpendicular $y = -\frac{3}{2}x - 1$ to and through $(9, -2)$

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

perpendicular $y = \frac{5}{6}x - 7$ to and through $(0, -2)$

Pick two points. Then find the line parallel to those points using the point $(5,6)$ and then find the line perpendicular using the point $(5,6)$.

Homework:

p. 121 #12-18, 20-21, 23-25, 42, 49

Present: 42, 49