

3.5

Learning Target: Understand how to write and graph linear functions.

- I can find the slope of a line, given 2 points
- I can graph linear equations in slope-intercept form.
- I can write and analyze linear equations that model/fit data.

Write the meaning of each vocabulary term.

slope - ratio of v. change to h. change } describes steepness
 - average rate of change

rise - change in the vertical direction (change on y-axis)

run - change in the horizontal direction (change on x-axis)

slope-intercept form $y = mx + b$

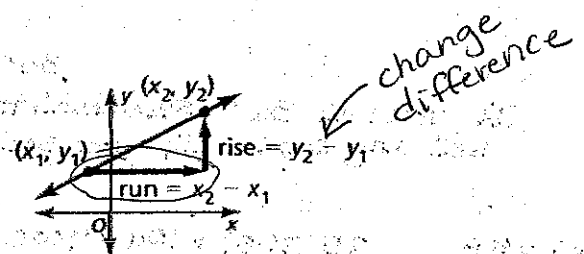
constant function $y = 0x + b$ $m = 0$

$y = b$ horizontal line

Core Concepts

Slope

The slope m of a nonvertical line passing through two points (x_1, y_1) and (x_2, y_2) is the ratio of the rise (change in y) to the run (change in x).



slope = $m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$ ← Memorize

$x_2 > x_1$

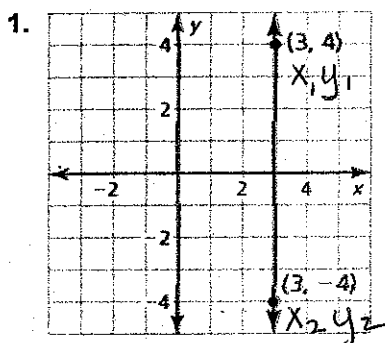
When the line rises from left to right, the slope is positive. When the line falls from left to right, the slope is negative.

Notes:

3.5 Notetaking with Vocabulary (continued)

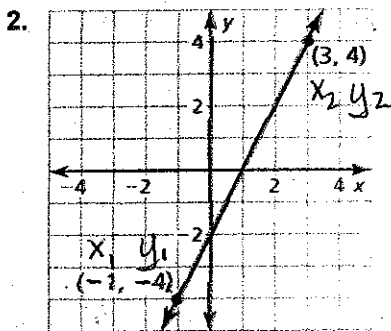
$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \frac{N}{O} \quad \frac{0}{K}$$

In Exercise 1-3, describe the slope of the line. Then find the slope.



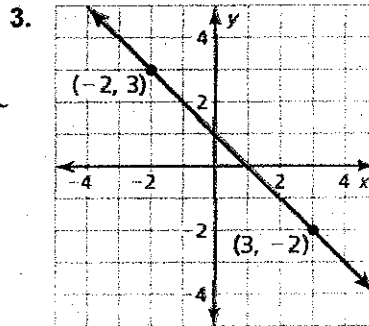
Vertical line

$$m = \frac{-4 - 4}{3 - 3} = \frac{-8}{0} \Rightarrow \text{undefined}$$



positive slope
rising line

$$m = \frac{4 - (-4)}{3 - (-1)} = \frac{8}{4} = \frac{2}{1} = 2$$



In Exercise 4 and 5, the points represented by the table lie on a line. Find the slope of the line.

	x_1	x_2		
x	1	2	3	4
y	-2	-2	-2	-2
	y_1	y_2		

$$m = \frac{-2 - (-2)}{2 - 1} = \frac{0}{1} = 0 = m$$

horizontal

	x_1	x_2		
x	-3	-1	1	3
y	11	3	-5	-13
	y_1	y_2		

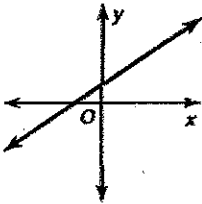
$$m = \frac{3 - 11}{-1 - (-3)} = \frac{-8}{2} = -4$$

$$m = -4$$

3.5 Notetaking with Vocabulary (continued)

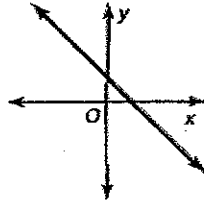
Slope

Positive slope



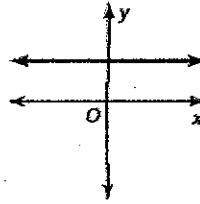
The line rises from left to right.

Negative slope



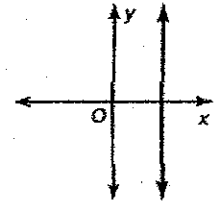
The line falls from left to right.

Slope of 0



The line is horizontal.

Undefined slope



The line is vertical.

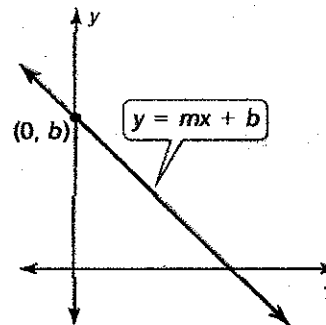
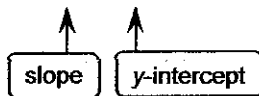
Slope-Intercept Form

Words A linear equation written in the form $y = mx + b$ is in **slope-intercept form**.

The slope of the line is m , and the y -intercept of the line is b .

Algebra

$$y = mx + b$$



In Exercise 6–8, find the slope and the y -intercept of the graph of the linear equation.

6. $6x + 4y = 24$
 $-6x \quad -6x$

$$4y = -6x + 24$$

$$y = \frac{-6}{4}x + \frac{24}{4}$$

$$y = \frac{-3}{2}x + 6$$

$$m = \frac{-3}{2} \quad y\text{-int. } (0, 6)$$

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

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

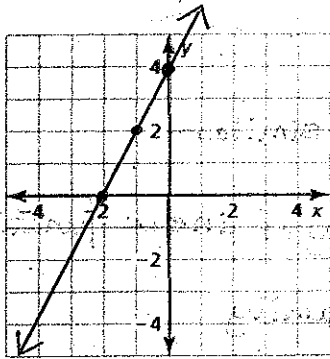
$$y\text{-int. } (0, 2)$$

8. $y = 5x$

$$m = 5$$

$$y\text{-int. } (0, 0)$$

9. A linear function f models a relationship in which the dependent variable decreases 6 units for every 3 units the independent variable decreases. The value of the function at 0 is 4. Graph the function. Identify the slope, y -intercept, and x -intercept of the graph.



$$m = \frac{-6}{-3} = \frac{2}{1} = \frac{-2}{-1} = \text{slope}$$

$$b = 4 \quad (0, 4) = y\text{-int.}$$

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

$$(-2, 0) \text{ x-int. } x = y$$