

2-3

Linear Functions and Slope-Intercept Form



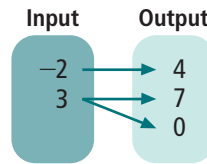
Vocabulary

Review

1. Circle the relation that is also a *function*.

$\{(0, 1), (-1, 3), (0, 4)\}$

x	y
2	5
3	3
4	1



Vocabulary Builder

slope (noun) slohp

Definition: Slope is the ratio of the vertical change to the horizontal change between two points.

Main Idea: Slope describes the steepness of a line in the coordinate plane.

Example: The slope of a hill is its steepness.

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

Use Your Vocabulary

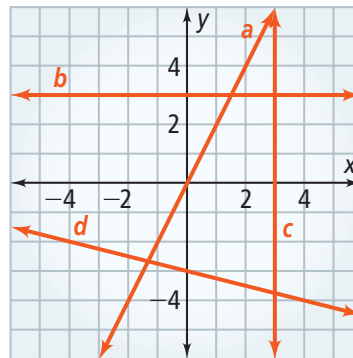
2. Use the graph at the right. Draw a line from the *slope* in Column A to the line with that slope in Column B.

Column A

- positive
- negative
- zero
- undefined

Column B

- line *a*
- line *b*
- line *c*
- line *d*



Take note

Key Concept Slope

The **slope** of a non-vertical line is the ratio of the vertical change to a corresponding horizontal change.

$$\text{slope} = \frac{\text{vertical change (rise)}}{\text{horizontal change (run)}} = \frac{y_2 - y_1}{x_2 - x_1}, \text{ where } x_2 - x_1 \neq 0$$

Underline the correct word to complete each sentence.

- If x_1 is less than x_2 , and y_1 is less than y_2 , then the slope is positive / negative .
- If x_1 is less than x_2 , and y_1 is greater than y_2 , then the slope is negative / positive .



Problem 1 Finding Slope

Got It? What is the slope of the line that passes through the points (5, 4) and (8, 1)?

5. Let $x_1 = 5$ and $x_2 = 8$. Then $y_1 =$ and $y_2 =$.

6. Complete the model below to find the slope.

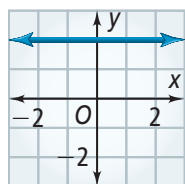
$$\begin{aligned} \text{slope} &= \frac{\text{change}}{\text{change}} = \frac{\text{ }_2 - y_1}{\text{ }_2 - x_1} \\ &= \frac{1 - \text{ }_1}{\text{ }_2 - \text{ }_1} = \text{ }_1 \end{aligned}$$

7. The slope of the line through the points (5, 4) and (8, 1) is .

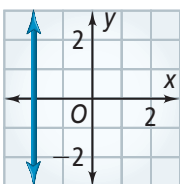
Take note

Summary Slope of a Line

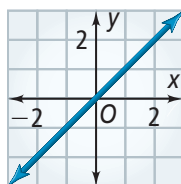
8. Label each graph *positive*, *negative*, *zero*, or *undefined* slope.



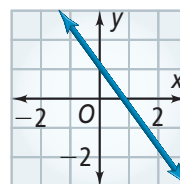
Horizontal line



Vertical line



Line rises from left to right



Line falls from left to right

Underline the correct word to complete each sentence.

- A line that has *zero slope* is horizontal / vertical .
- A line that has *undefined slope* is horizontal / vertical .

Key Concept Slope-Intercept Form

The **slope-intercept form** of an equation of a line is $y = mx + b$, where m is the slope of the line and $(0, b)$ is the y -intercept.

11. Place a \checkmark in the box if the equation is in slope-intercept form. Place an \times if it is not.

$y = 3x + 7$

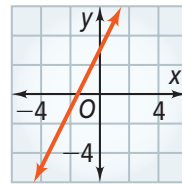
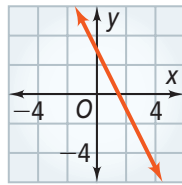
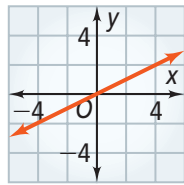
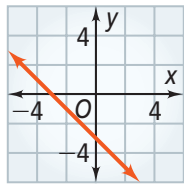
$8y = x - 11$

$y = x$

12. The slope of the line with equation $y = 4x + 2$ is .

13. The y -intercept of the line with equation $y = -2x - 3$ is $(0, \text{ })$.

14. Circle the graph that can be represented by the equation $y = -2x + 3$.



Problem 2 Writing Linear Equations

Got It? What is the equation of the line with $m = 6$ and y -intercept $(0, 5)$?

15. Write a phrase to describe each constant value.

$m =$, $b =$

16. The equation of the line in slope-intercept form is .

Problem 3 Writing Equations in Slope-Intercept Form

Got It? Write the equation $3x + 2y = 18$ in slope-intercept form. What are the slope and y -intercept?

17. Use the justifications at the right to solve the equation for y .

$3x + 2y = 18$

Write the original equation.

$2y = 18 - \text{ }$

Subtract from each side.

$y = \frac{18 - \text{ }}{\text{ }}$

Divide each side by .

$y = 9 - \text{ }x$

Simplify.

18. In slope-intercept form, the equation is $y = \text{ }.$

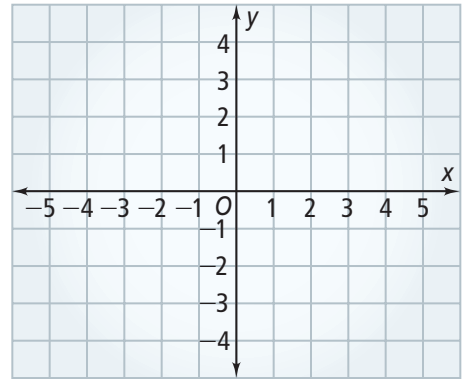
19. The slope is , and the y -intercept is .



Problem 4 Graphing a Linear Equation

Got It? What is the graph of $4x - 7y = 14$?

20. Write the equation in slope-intercept form.



21. Graph the function on the coordinate plane at the right.



Lesson Check • Do you UNDERSTAND?

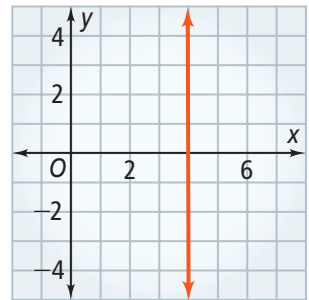
Explain why the slope of a vertical line is called “undefined.”

22. Cross out the points below that are NOT on the line at the right.

(0, 4) (4, 1) (3, 4) (4, -3)

23. Find the slope of the line at the right.

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



24. The x -coordinate of all of the points on this line is \square .

The difference $x_2 - x_1$ always equals \square for this line.

25. Now explain why the slope of a vertical line is undefined.



Math Success

Check off the vocabulary words that you understand.

linear function slope-intercept form

Rate how well you can *write and graph equations of lines*.

