

3.5 and 4.1 Explain – Graphing and Writing in Slope-Intercept Form - Notes

Essential Question: How can you describe the graph of the equation $y = mx + b$?
Given the graph of a linear function, how can you write an equation of the line?

Main Ideas/ Questions	Notes/Examples
What You Will Learn	<ul style="list-style-type: none"> To interpret slopes and y-intercepts of linear equations. To use slopes and y-intercepts to solve real-life problems To write equations in slope-intercept form given table of values, graphs, and verbal descriptions.

LINEAR EQUATIONS

Slope-intercept form

$$y = mx + b$$

slope \rightarrow

\leftarrow y-intercept

x and y represent the ordered pairs that are contained on the line.

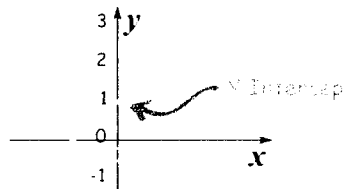
Slope is.....

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x}$$

Also called the Rate of Change.....

- $\frac{\text{change in the dependent variable}}{\text{change in the independent variable}}$
- slope with units, Ex.: $\frac{\text{miles}}{\text{gallons}}$, $\frac{\text{cost}}{\text{item}}$, $\frac{\text{feet}}{\text{second}}$
- Top unit depends on the bottom unit (ex.: miles depend on gallons)

The y-intercept is..... sometimes called the constant, the starting amount, or the initial amount.



x	y
1	1.9
0	1
-1	0.2

b = 1

1. The graph shows the height y (in meters) of a helicopter as it descends in x seconds. Find and interpret the rate of change and y-intercept of the given line.

$$m = \frac{30 - 20}{1 - 3} = \frac{10}{-2} = -5$$

Rate of Change: -5

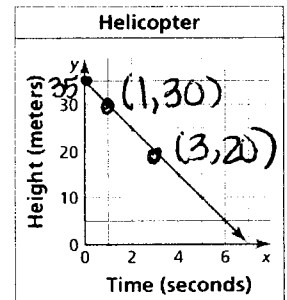
y-intercept: 35

Represents:

meters per second

Represents:

Starting height



Identifying and Interpreting Slopes From Tables

Slope of a Line: $\frac{y_2 - y_1}{x_2 - x_1}$ for 2 points (x_1, y_1) and (x_2, y_2)

Practice: Determine the slope for each of the following.

2.

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

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

3.

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

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

4. The table shows the number of songs purchased, s, and the total cost C (in dollars). Find and interpret the rate of change of the line.

Rate of Change: $\frac{4.95 - 2.97}{5 - 3} = 0.99$

Represents: cost per song (each song costs \$.99)

Number of songs, s	Cost (dollars), C
3	2.97
5	4.95
7	6.93

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Graphing Linear Equations

Practice: Find the slope and the y-intercept of the graph of the linear equation and then graph.

5. $4x + 2y = 12$
 $2y = -4x + 12 \quad m = -2 \quad b = 6$
 $y = -2x + 6$

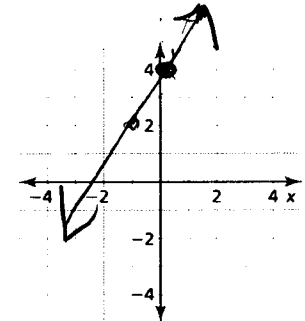
6. $3x + y = 0$
 $-3x \quad y = -3x \quad m = -3 \quad b = 0$

7. $2x + y = 2$
 $y = -2x + 2 \quad m = -2 \quad b = 2$

8. A linear function f models a relationship in which the dependent variable decreases 6 units for every 3 units the independent variable decreases and $f(0) = 4$.

$\frac{\Delta y}{\Delta x} = \frac{-6}{-3} = 2$
 $(0, 4) \rightarrow$

- a. Graph this function
- b. Slope: 2
- c. y-intercept: 4



Writing Linear Equations

Practice: Write an equation in slope-intercept form for each of the following linear functions.

9.

x	y
0	1.2
1	1.4
2	1.6
4	2

$m = \frac{1.6 - 1.2}{2 - 0} = 0.2$
 $y = 0.2x + 1.2$

10.

Time (hours), x	Admission (dollars), y
6	54.99
7	54.99
8	54.99

$y = 54.99$

11.

$b = 2$
 $m = -1$
 $y = -x + 2$

12. Write the equation of a line in slope-intercept form that passes through $(-3, 5)$ and $(0, -1)$.

$m = \frac{-1 - 5}{0 - (-3)} = \frac{-6}{3} = -2$
 $y = -2x - 1$

13. An electrician charges \$120 after 2 hours of work and \$190 after 4 hours of work.

x	y
0	50
2	120
4	190

- a. What is the electrician's initial fee?
50
- b. How much does the electrician charge per hour?
 $\frac{190 - 120}{4 - 2} = 35$
- c. Write a linear model that represents the total cost as a function of the number of hours worked.
- d. What is the total cost for 7 hours of work?
 $35(7) + 50 = 295$

$y = 35x + 50$

$= 295$

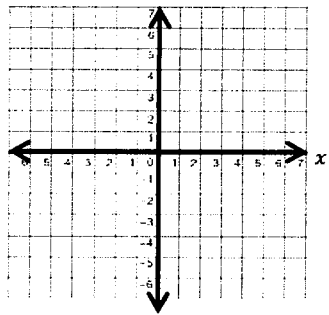
3.5 and 4.1 Graphing and Writing in Slope-Intercept Form

In Exercises 8–10, find the slope and the y-intercept of the graph of the linear equation and then graph.

1. $7x + y = 0$

Slope =

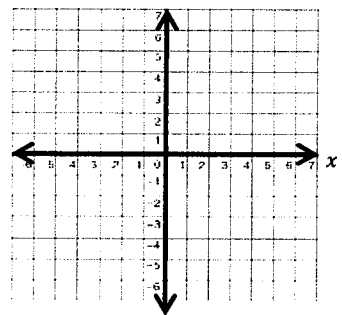
y-in. =



2. $-3x + y = 7$

m =

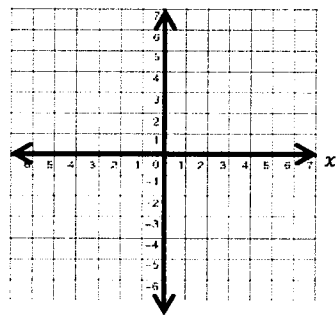
b =



3. $x - y - 9 = 0$

Slope =

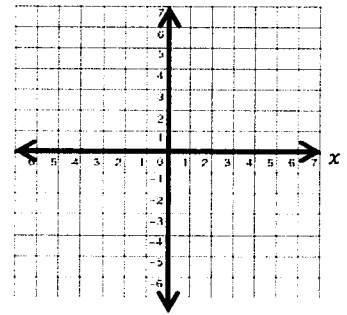
y-in. =



4. $3x - y + 1 = 0$

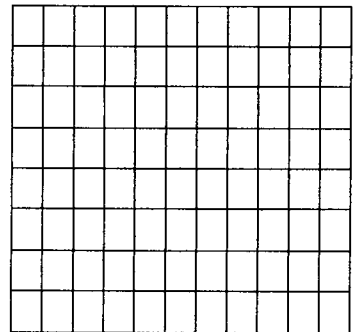
m =

b = y



5. The function $c(x) = 0.5x + 70$ represents the cost c (in dollars) of renting a truck from a moving company, where x is the number of miles you drive the truck.

- a. Graph the function.
- b. Identify: Domain: _____ Range: _____
- c. Find the Slope: _____ Interpret: _____
- d. Find the c -intercept: _____ Interpret: _____



In Exercises 6 and 7, write an equation of the line in slope-intercept form with the given characteristics.

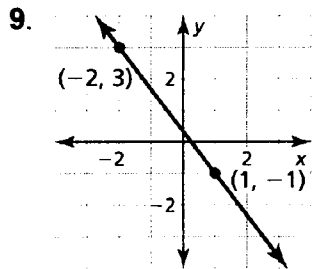
6. $m = 3$
 $b = 8$

7. slope: -4
passes through: $(0, 0)$

8. Describe and correct the error in writing an equation of the line with a slope of 2 and a y-intercept of 7.

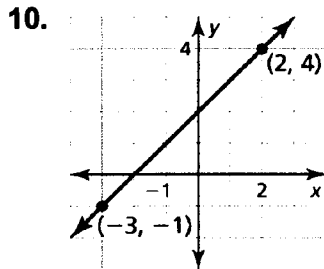
~~$y = 7x + 2$~~

In Exercises 9 - 11, write the equation in slope-intercept form.



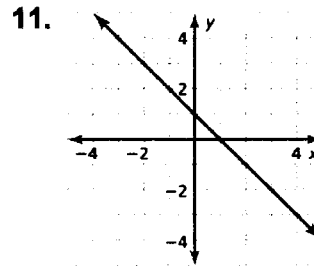
$m = \underline{\hspace{2cm}}$ $b = \underline{\hspace{2cm}}$

Equation: _____



$m = \underline{\hspace{2cm}}$ $b = \underline{\hspace{2cm}}$

Equation: _____



$m = \underline{\hspace{2cm}}$ $b = \underline{\hspace{2cm}}$

Equation: _____

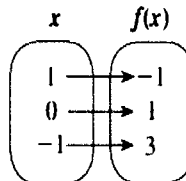
In Exercises 12 - 15, write an equation of the line in slope-intercept form that passes through the given points.

12. $(2, 3), (0, 9)$

13.

Miles, x	Cost (dollars), y
0	40
50	80
100	120

14.



15.

x	0	2	5	7
y	3	3	3	3

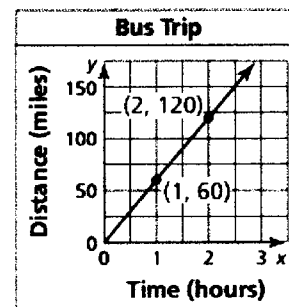
16. The graph shows the distance y (in miles) that a bus travels in x hours. Find and interpret the slope and y -intercept of the line.

Slope = _____

y -intercept: _____

Represents: _____

Represents: _____



Write an equation: _____

Domain: _____

Range: _____

17. A recording studio charges musicians an initial fee of \$50 to record an album. Studio time costs an additional \$75 per hour.

- Write a linear model that represents the total cost of recording an album as a function of studio time (in hours).
- Is it less expensive to purchase 12 hours of recording time at the studio or a \$750 music software program that you can use to record on your own computer? Explain.

18. You commute to school by walking and by riding a bus. The graph represents your commute.

a. Describe your commute in words.

b. Calculate and interpret the slopes of the different parts of the graph.

Section a:

Section b:

Section c:

c. What is the "d"-intercept?

What does it represent?

