Intercepts, Horizontal and Vertical Lines

Drive Time

SUGGESTED LEARNING STRATEGIES: Shared Reading, Marking the Text, Create Representations, Interactivating Word Wall, Vocabulary Organizer, Activating Prior Knowledge

My Notes

Matt is driving from Tucson to Flagstaff, Arizona. After driving 20 miles on two-lane roads, he gets on the interstate highway where he will drive 65 mph.

1. Write a linear equation that gives Matt's distance from Tucson given the number of hours since Matt has been driving on the interstate.

2. What are the slope and y-intercept of the line in Question 1?

ACADEMIC VOCABULARY

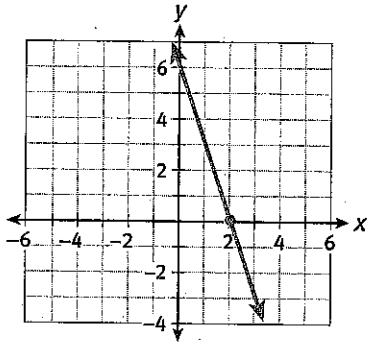
***x*-intercept**

The ***x*-intercept** of a line is the point where the line crosses the x-axis. Its coordinates will be in the form $(c, 0)$ where c is a real number.

EXAMPLE 1

Find the x-intercept on a graph.

Step 1: *Find the intersection of the line with the x-axis.*

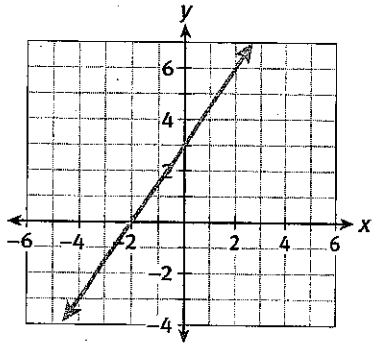


Solution: The x-intercept is 2, or the point (2, 0).

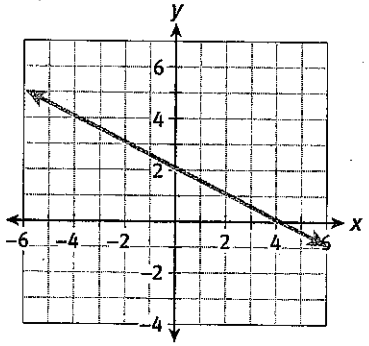
TRY THESE A

Find the x- and y-intercepts of the graphs below.

a.



b.



SUGGESTED LEARNING STRATEGIES: Discussion Group, Think/Pair/Share, Quickwrite

My Notes

To find the x-intercept of a line algebraically, use the fact that the intercept lies at the point $(c, 0)$.

EXAMPLE 2

A. Find the x-intercept of the line $y = 4x - 24$ algebraically.

Step 1: *Substitute 0 for* y.

$$0 = 4x - 24$$

Step 2: *Solve for* x.

$$0 = 4x - 24$$
$$+24 \quad +24$$
$$\frac{24}{6} = \frac{4x}{4}$$
$$6 = x$$

Solution: The x-intercept is 6. The coordinates are (6, 0).

To find the y-intercept of a line algebraically, use the fact that the intercept lies at the point $(0, d)$.

B. Find the y-intercept of the line $y = 4x - 24$ algebraically.

Step 1: *Substitute 0 for* x.

$$y = 4(0) - 24$$

Step 1: *Solve for* y.

$$y = -24$$

Solution: The y-intercept is -24. The coordinates are $(0, -24)$.

TRY THESE B

Find the x- and y-intercepts of the following equations.

a. $y = -5x - 10$ **b.** $y = \frac{1}{4}x + 5$ **c.** $y = 0.5x + 2$

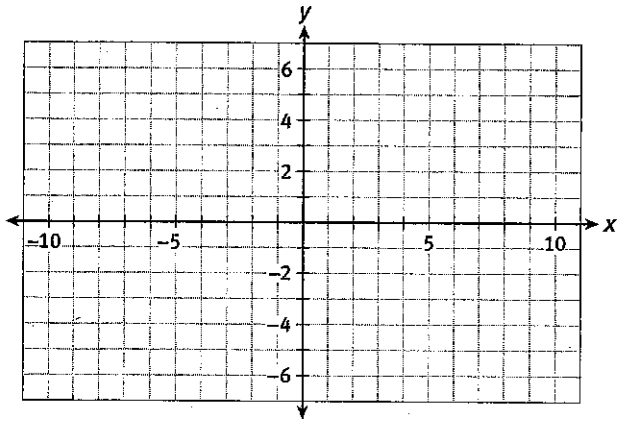
d. $y = 7 + 2x$ **e.** $2x + 3y = 9$

3. Find the x- and y-intercepts of the equation you found in Question 1 algebraically.

My Notes

4. Graph each of the following equations.

a. $y = \frac{1}{2}x$ **b.** $y = \frac{1}{5}x$ **c.** $y = \frac{1}{10}x$



5. What happens to the graph of the equation of a line as the slope gets closer to zero?

6. Predict what a line with a slope that is equal to zero would look like.

SUGGESTED LEARNING STRATEGIES: Create Representations

My Notes

7. Fill in the table values for the following equations.

a. $y = 0x + 3$

x	y
−3	
−2	
−1	
0	
1	
2	
3	

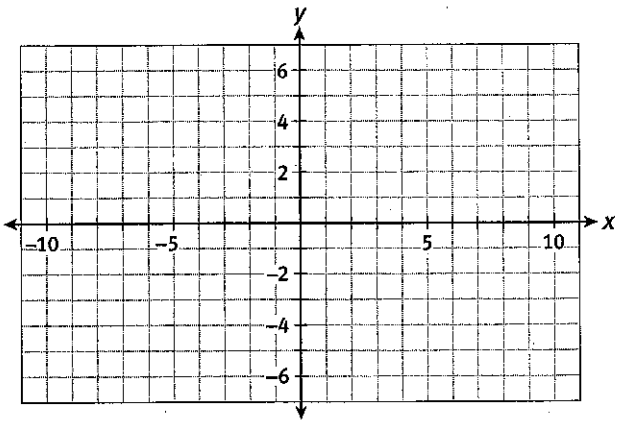
b. $y = 0x + 6$

x	y
−3	
−2	
−1	
0	
1	
2	
3	

c. $y = 0x - 3$

x	y
−3	
−2	
−1	
0	
1	
2	
3	

8. Graph the equations from Question 7.



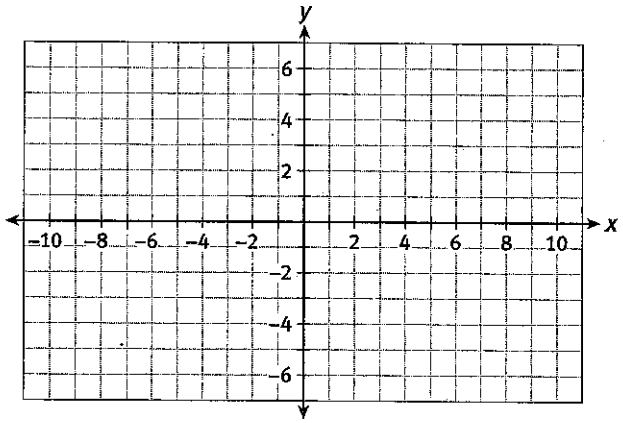
9. Simplify and rewrite the equations in Question 7. What patterns do you notice about equations of lines that have a slope of zero?

SUGGESTED LEARNING STRATEGIES: Create Representations, Look for a Pattern, Interactive Word Wall, Vocabulary Organizer

My Notes

10. Graph each of the following equations.

a. $y = 5x$ **b.** $y = 7x$ **c.** $y = 10x$



11. What happens to the graph of the line as the slope gets larger?

12. On the coordinate grid above, draw a vertical line through the point (5, 0).

13. Using the line you drew in Question 12:

a. Plot and label the coordinates of 4 additional points on the line.

b. Express the slope of the line in the form $\frac{\Delta y}{\Delta x}$.

As the slope of a line increases, the line becomes closer to a vertical line. When the denominator of a slope ratio is zero, the slope is said to be undefined. The slope of a vertical line is **undefined**.

14. Look at the line you drew in drew in Question 12.

a. What do you notice about the y values?

b. What do you notice about the x values?

c. Why do you think the equation of the line is $x = 5$?

SUGGESTED LEARNING STRATEGIES: Look for a Pattern, Create Representations

My Notes

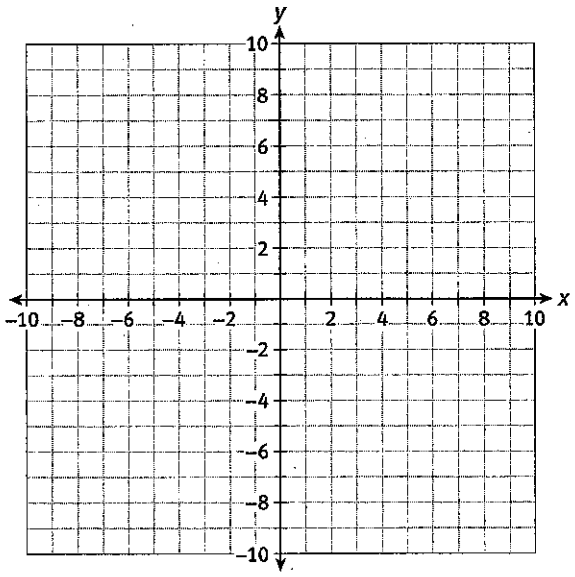
15. Graph the following horizontal and vertical lines.

a. $x = -3$

b. $y = -2$

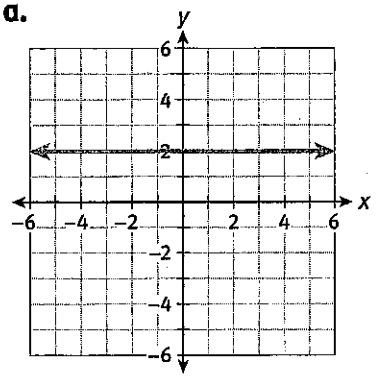
c. $x = 6$

d. $y = 4$

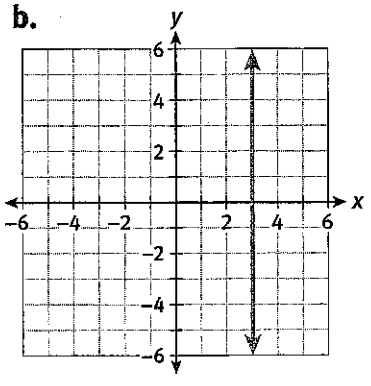


16. Write the equations of the following horizontal and vertical lines.

a.



b.



My Notes

EXAMPLE 3

Graph $y = 2x + 6$ using x- and y-intercepts.

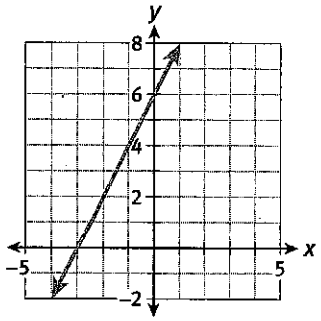
Step 1: Find the x- *and* y-*intercepts algebraically.*

Find the x-intercept	Find the y-intercept
$0 = 2x + 6$	$y = 2(0) + 6$
$-6 = 2x$	$y = 6$
$-3 = x$	

Step 2: Plot the coordinates of the x- *and* y-*intercepts.*

Step 3: Connect the intercepts with a line.

Solution:



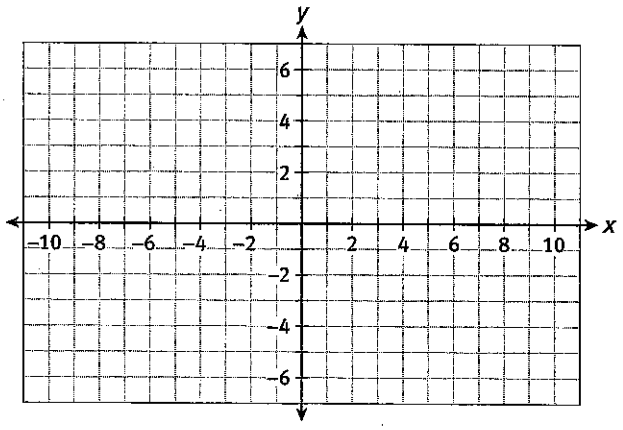
TRY THESE C

Graph the equations of the following lines using x and y-intercepts.

a. $y = x + 5$

b. $y = -x - 4$

c. $y = -3x + 6$

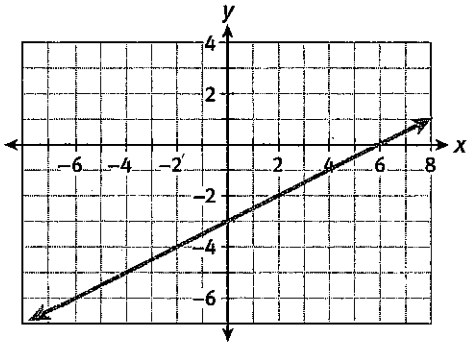


CHECK YOUR UNDERSTANDING

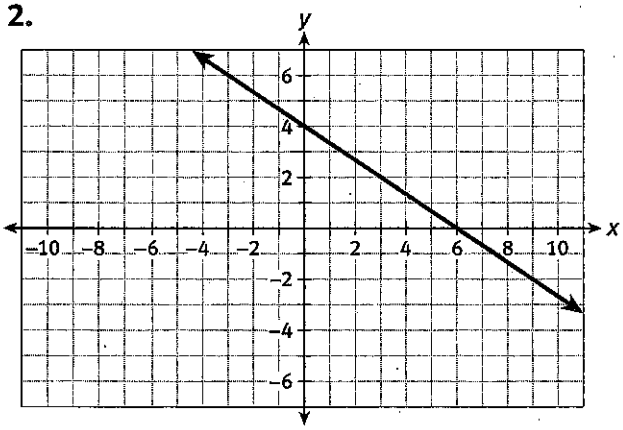
Write your answers on notebook paper. Show your work.

Find the *x*- and *y*-intercepts of the following graphs.

1.



2.



For 3–6, find the *x*- and *y*-intercepts of the equations.

3. $y = 8x + 24$

4. $y = 3x + 4$

5. $y = -2x + 5$

6. $5x + y = 8$

Graph the lines that have the following intercepts.

7. *x*-intercept: 6
y-intercept: −2

8. *x*-intercept: −3
y-intercept: 7

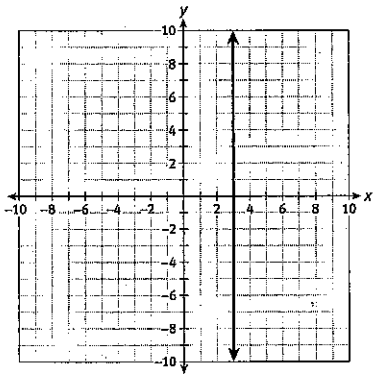
Graph the following lines

9. $y = 6$

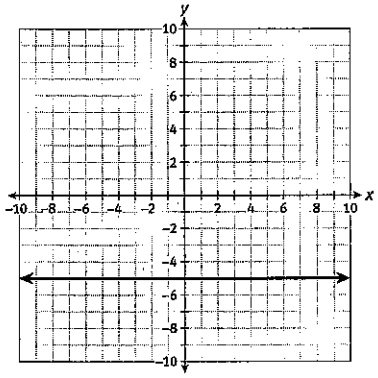
10. $x = -4$

11. Write the equation of the lines graphed below.

a.



b.



12. MATHEMATICAL When would it be easier to graph a line using its slope and *y*-intercept than to graph it using its *x*- and *y*-intercepts? Explain your reasoning.