Lesson 7: Absolute Value Functions and Graphs
Algebra 2 A Unit 2: Functions, Equations, and Graphs

Objectives: Draw the graph of absolute value functions; Graph transformations of absolute value functions
Materials: *Course Materials are not available as of this time as this User has not been assigned to any Courses. Please check back once the User has been placed into a Course.*

Modeling

Have you ever taught a dog to fetch? This trick involves teaching a dog to stand next to you while you throw an object, like a stick or a ball, and then having the dog fetch it and bring it back to you. A function can be used to model the distance the dog travels in relation to the starting point and the time it takes the dog to fetch the object. In previous lessons, you learned how to model a variety of real-world examples using functions. In this lesson, you will learn how to model this scenario while exploring absolute value functions and their graphs.

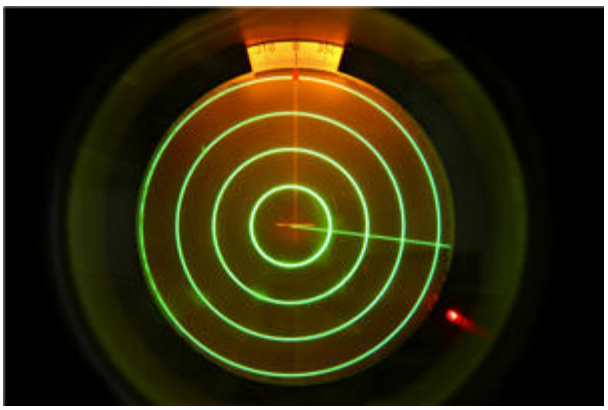
Objectives

- Draw the graph of absolute value functions
- Graph transformations of absolute value functions

Key Words

- absolute value function
- axis of symmetry
- vertex

Absolute Value



What makes an absolute value function different from functions you have used previously? One obvious difference is that the function involves absolute value. This creates a v-shaped graph where the point of the v is a maximum or minimum value called the vertex. The graph is also symmetrical about a vertical line through the vertex, called an axis of symmetry.

Click on the link below to access the Absolute Value Functions worksheet. Complete as much of the worksheet as you can using the information provided in the tutorial

below. Use pp. 107–110 in *Algebra 2* to complete the rest of the worksheet. Be sure to include the completed worksheet in your math binder.

Absolute Value Functions

Click on the link below to watch the "Graphing Absolute Value Functions" Teachlet® tutorial.

Graphing Absolute Value Functions

Click on the link below to access Graphing Absolute Value Functions Transcript.

Graphing Absolute Value Functions Transcript

Complete the Lesson Check on p. 111 in *Algebra 2* to apply what you have learned.

After you have completed the problems on the Lesson Check, answer the questions below:

1. Make a table of values for the function given in #2 of the Lesson Check. What is the vertex of this function?
2. Is this function a shift to the left or to the right?
3. Compare this function to the one given in #1 of the Lesson Check. What is different about the function in #2 that makes the vertex different from what you might have expected?
4. Now graph the equation $y = |-x+2|$ and find the vertex and axis of symmetry. Is it a shift to the left or to the right?

Click the Show Answer button to check your answers.

Show Answer

Answers:

1. The vertex of this function is (–3, 9).

x	*y*
–4	10
–3	9
–2	10
–1	11
0	12
3	15

2. It is a shift to the left.
3. The *x* variable in #2 is negative, whereas the *x* variable in #1 is positive.

4. The vertex is at (2, 0) and the axis of symmetry is the vertical line $x = 2$. It is a shift to the right.

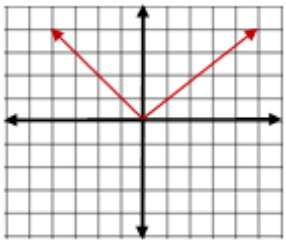
Click on the link below to access the online textbook.

Algebra 2

Tip: Take note that absolute value functions contain two linear parts. However, they are not considered linear functions.

Complete the following activities.

1. To further explore absolute value functions and transformations, click on the links below to complete the Solve It! and Dynamic Activity for Chapter 2, Lesson 7 from the PowerAlgebra website.



   Solve It!

   Dynamic Activity

2. To practice concepts from this lesson, complete problems 15, 17, 21, 27, 29, 33, 35–37, and 43 on pp. 111–112 of *Algebra 2*.
3. Continue working on the portfolio and participating in the discussion.

Tip: Please return to Unit 2, Lesson 1, page 4 to access the discussion link in order to add your comments.

Click on the link below to access the online textbook.

Algebra 2

Complete the following review activities.

In this lesson, you learned about absolute value functions and their graphs. You also learned how transformations, such as translations, reflections, and vertical stretch and compression affect the equations and graphs of these types of functions. The activities that follow will help you review the concepts introduced in this lesson.

1. In the writing journal section of your math binder, complete problem 33 on p. 112 in *Algebra 2*. Name the journal entry Absolute Value Functions.
2. Click on the link below to complete the 2-7 Think About a Plan worksheet to practice concepts from this lesson.

   2-7 Think About a Plan

3. Recall the fetch trick scenario from the beginning of this lesson. Suppose the table below shows the distance the dog travels from the starting point and the time.

   1. Sketch the graph of the data in the table.
   2. Sketch the graph of the function $f(x) = |x|$ on the same graph.
   3. Write a function that models the data. Below is a list of the transformations from the parent function to help you get started.

      -horizontal translation to the left

      -vertical stretch

-reflection in the x–axis

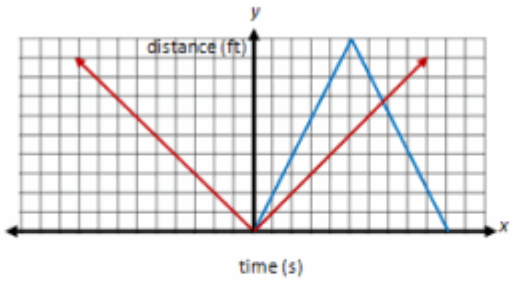
-vertical translation up

time in seconds	distance in feet
x	from starting point $f(x)$
1	2
2	4
3	6
4	8
5	10
6	8
7	6
8	4
9	2
10	0

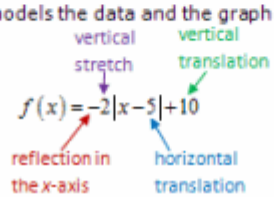
Click on the Show Answer button below to check your answer.

Show Answer

Answer:



The function that models the data and the graph outlined in blue is seen below:



Click on the link below to access the online textbook.

Algebra 2

Lesson Answers

Click on the link below to check your answers to 2-7 Think About A Plan.

2-7 Think About a Plan Answers

Absolute Value Functions and Graphs

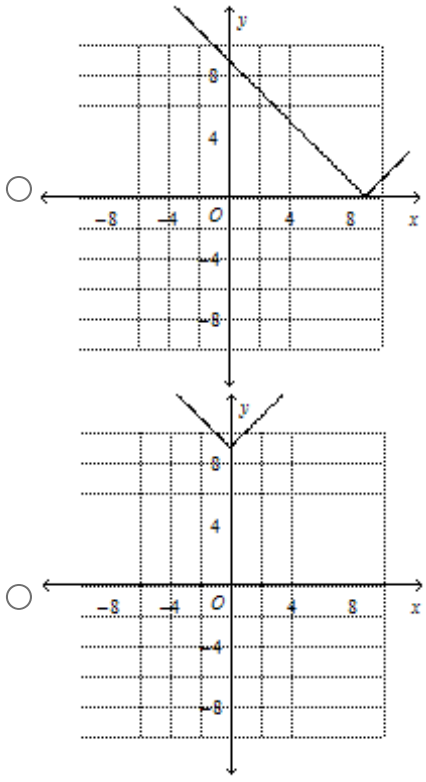
Multiple Choice

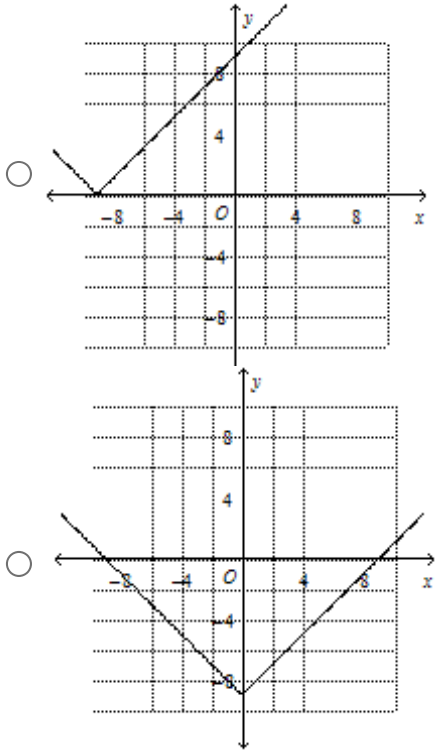
1.

What is the graph of the absolute value equation?

$y = |x| - 9$

(1 point)



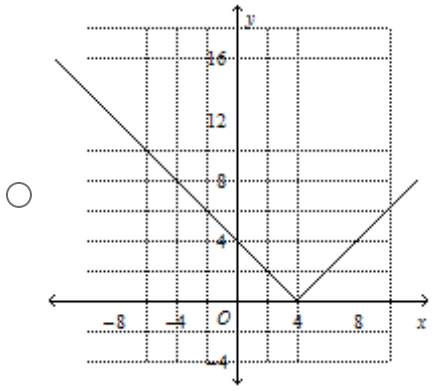


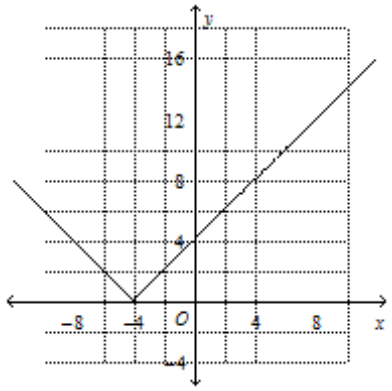
2.

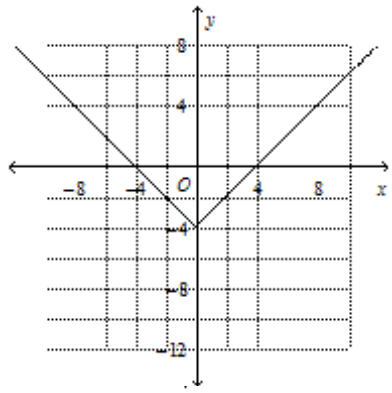
What is the graph of the absolute value equation?

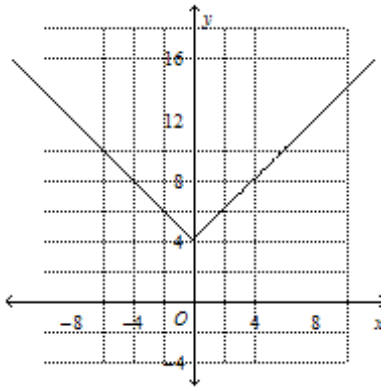
$y = |x + 4|$

(1 point)



○ 

○ 

○ 

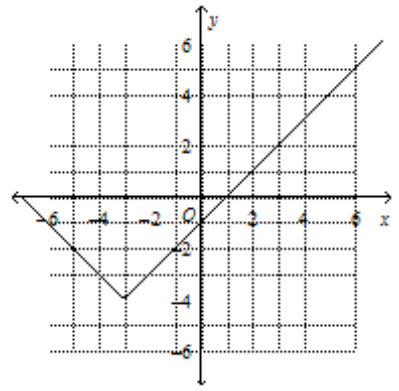
3.

What is the graph of the absolute value equation?

$y = |x + 3| - 4$

(1 point)

○


y
x
O
6
4
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−2
−4
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−2
2
4
6

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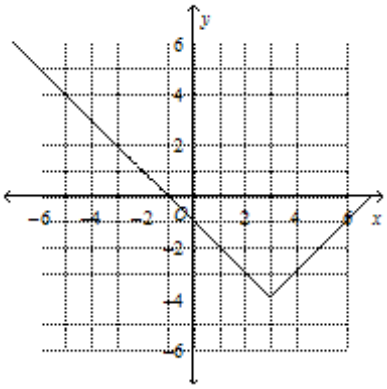
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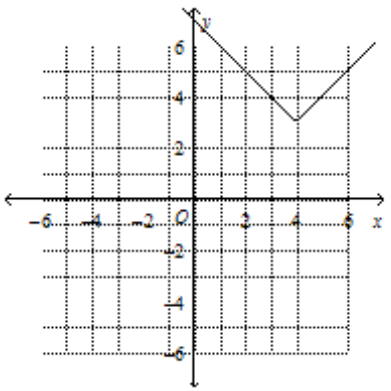
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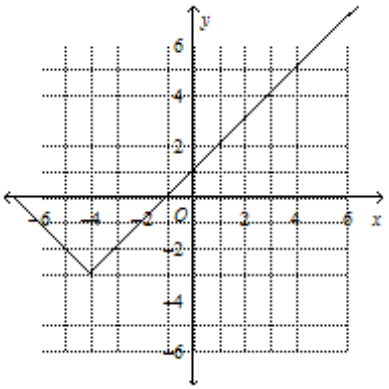
y
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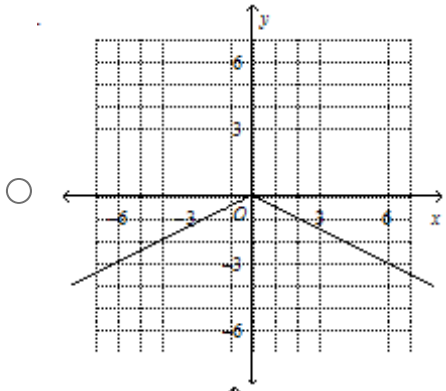
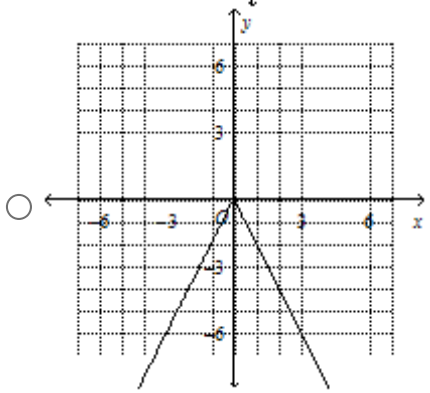
4.

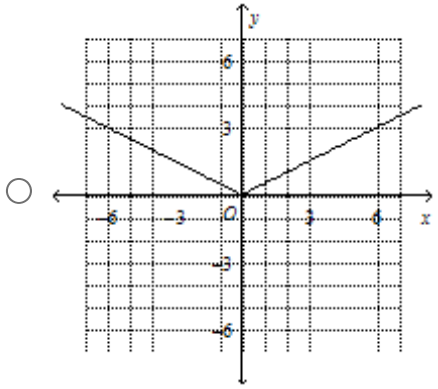
What is the graph of the absolute value equation?

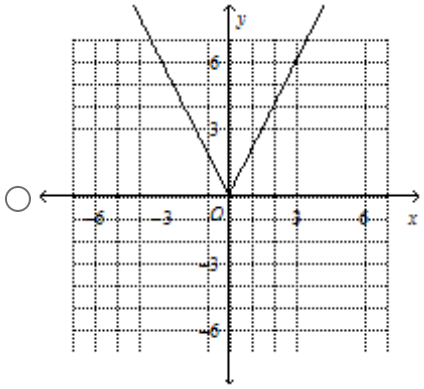
$$y = -\frac{1}{2}|x|$$

(1 point)



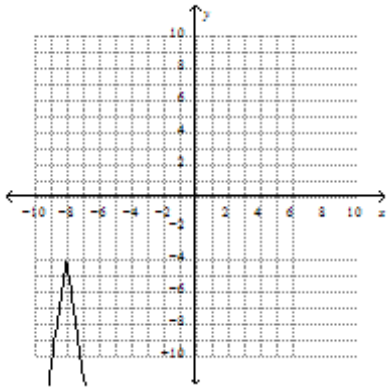






5.

What is the absolute value function?



(1 point)

- $y = 7|x + 8| - 4$
- $y = -7|x - 8| + 4$
- $y = -7|x + 8| - 4$
- $y = -7|x - 8| - 4$