PRACTICE & PROBLEM SOLVING

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Practice Tutorial

Additional Exercises Available Online

UNDERSTAND

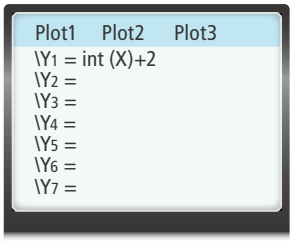
10. Model With Mathematics Give two examples of functions that include an absolute value expression and have a vertex of (−1, 3).

11. Mathematical Connections Consider the function $f(x) = 2|x + 1| - 7$.

a. A linear function containing one branch of the function is $f(x) = 2(x + 1) - 7$. What linear function contains the other branch?

b. For the general function $f(x) = a|x - h| + k$, what are the two linear functions containing the branches?

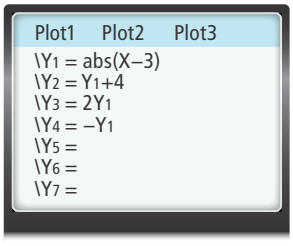
12. Use Appropriate Tools Explain how you can write a second step function that translates the graph of the step function shown down 6 units.



13. Error Analysis Describe and correct the errors a student made in describing the graph of the function $f(x) = -0.5|x + 1| + 3$.

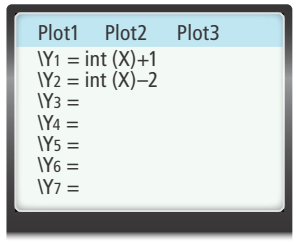
> The graph of $y = -0.5|x + 1| + 3$ compresses the graph of $y = |x|$ vertically toward the x-axis, and moves the vertex to $(1, 3)$. ✗

14. Higher Order Thinking Write each function Y1 through Y4. Explain how the graphs of Y2 through Y4 translates the graph of Y1.



PRACTICE

15. Describe the transformation for the pair of step functions. SEE EXAMPLE 1



Find the vertex and graph each function. SEE EXAMPLES 2, 3, AND 4

16. $f(x) = |x| - 2$

17. $f(x) = |x| + 1$

18. $f(x) = |x + 0.5|$

19. $f(x) = |x - 1|$

20. $f(x) = |x + 7| - 2$

21. $f(x) = |x - 0.5| + 0.5$

Compare the graph of each function with the graph of $f(x) = |x|$. Describe the transformation, then graph the function. SEE EXAMPLES 4, 5, AND 6

22. $g(x) = \frac{1}{3}|x + 6| - 1$

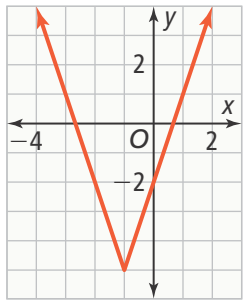
23. $g(x) = -4|x - 2| - 1$

24. $g(x) = -|x + 3.5| + 4$

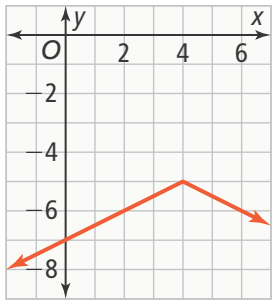
25. $g(x) = \frac{5}{4}|x - 2| + 7$

Write a function for each graph. SEE EXAMPLE 6

26.



27.



What function g describes the graph of f after the given transformations?

28. $f(x) = |x|$; translated 2 units up and 1 unit right

29. $f(x) = |x| + 1$; translated 3 units down and 2 units left

30. $f(x) = |x|$; reflected across the x-axis and translated 4 units up

31. $f(x) = |x|$; vertically stretched by a factor of 3 and reflected across the axis

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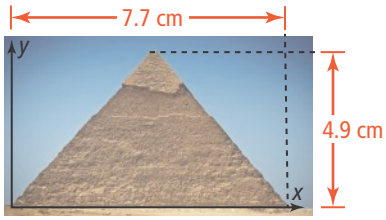
APPLY

32. Model With Mathematics The rates for Carolina's dog boarding service are shown. Carolina plans on increasing the rate for the first hour by $5.

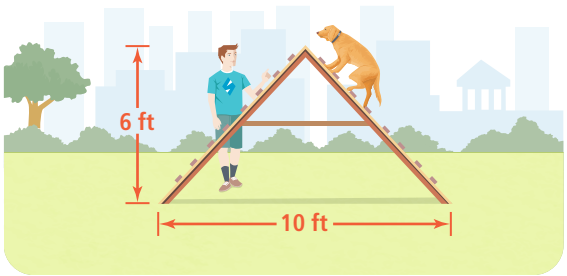
a. Make a graph that shows the step functions for the cost of boarding a dog before and after the rate increase.

b. How much will it cost to board a dog for 4 hours after the rate increase?

33. Model With Mathematics Emma wants to model the sides of a pyramid by using a function that includes an absolute value expression. Emma will place the pyramid on a coordinate grid as shown. What function should she use? For what domain?



34. Make Sense and Persevere One part of a dog agility course is an obstacle called an A-frame. Assume that the left corner of the A-frame corresponds to the point (0, 0). What function that includes an absolute value expression could you use to model the obstacle? What is the domain of the function? Explain your reasoning.



ASSESSMENT PRACTICE

Fill in the blanks with the correct answer.

35. The graph of $g(x) = -|x + 15| - 7$, is a vertical translation of the graph of the _____ function, $f(x) = |x|$ by _____ units. The graph of g is a horizontal translation of the graph of f by _____ units. The vertex of the graph of g is _____. The y-intercept is _____, and there is/are _____ x-intercept(s).

36. SAT/ACT Which function has the same graph as $f(x) = 4|x - 2| + 2$?

Ⓐ $f(x) = 2|2x - 4| + 2$

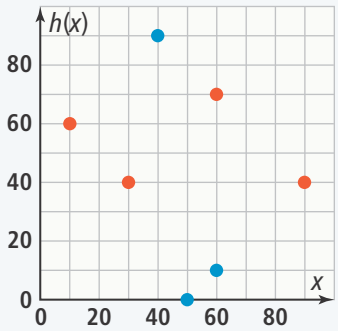
Ⓑ $f(x) = 2|2x - 1| + 2$

Ⓒ $f(x) = 2|2x - 1| + 1$

Ⓓ $f(x) = 2|2x - 4| + 1$

Ⓔ none of these

37. Performance Task You are playing a ship trapping game. There are 4 of your opponent's red ships on the screen. You can send out 3 strikes from your blue ships through the red ships' positions to capture them. Each strike sends two lasers that resemble the graph of a function with an absolute value expression.



Part A How can symmetry help you find a path to capture two ships?

Part B Write three functions that represent strike paths to capture the ships. Show how each ship is captured by a function.

Part C For your function that captures two ships, can you write a different function from one of your other ships that represent strikes paths to capture these two ships? Explain.