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Study Guide and Intervention

Transforming and Analyzing Absolute Value Functions

Example **Describe the transformation.**

What transformations of the absolute value parent function, $f(x) = |x|$, will result in the graph of the absolute value function $g(x) = -\frac{1}{2}|2x + 1| - 3$?

Solution

Step 1 **Rewrite the equation of g(x) in general form to determine the values of the parameters a, b, c, and d.**

$$g(x) = -\tfrac{1}{2}|2x + 1| - 3$$
$$g(x) = -\tfrac{1}{2}|2x - (-1)| - 3$$

Therefore, $a = -\frac{1}{2}$, $b = 2$, $c = -1$, and $d = -3$

Step 2 **Use the values of the parameters to describe the transformations of the absolute value parent function f(x) that are necessary to produce g(x).**

$a = -\frac{1}{2}$, so $0 < |a| < 1$. The range values (y-coordinates) of the absolute value parent function are multiplied by a factor of $\frac{1}{2}$ in order to vertically compress the graph

since $a < 0$, the graph will be reflected across the x-axis

$b = 2$, so there is a horizontal compression by a factor of $\frac{1}{2}$.

$c = -1$, so $c < 0$. The graph of the absolute value parent function will translate $\left|\frac{-1}{2}\right| = \frac{1}{2}$ units to the left

$d = -3$ so the graph will translate 3 units down

Exercises

For questions 1-4, describe the transformation of the absolute value parent function, f(x) = |x| that will result in the graph of the absolute value function given.

1. $h(x) = = -|x+3|-2$

2. $h(x) = 3|x+4|-5$

3. $h(x) = -2|x-5|+1$

4. $h(x) = \frac{1}{4}|x+1|$

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Study Guide and Intervention

Transforming and Analyzing Absolute Value Functions (cont.)

Example **Identify the domain, range, relative minimum, relative maximum, x-intercept and y-intercept of the absolute value function described by the equation shown below. Write the domain and range as intervals, and in set builder notation.**

$$f(x) = (x + 1)(x - 3)(2x - 1)$$

Solution

Step 1 **Determine the domain and range of f(x).**

Since this is a absolute value function, the domain and range are *all real numbers*; the range is found using the equation.

As an interval

Domain: $(-\infty, \infty)$ Range: $[-2, \infty)$

Set builder notation

Domain: $\{x|x \in \mathbb{R}\}$ Range: $\{y|y \geq -2\}$

Step 2 **Determine the x-intercept of f(x).**

Use your calculator to find the x-intercepts

(-1, 0); (3, 0); (.5, 0)

Step 3 **Determine the y-intercept of f(x).**

The y-intercept is found when x = 0, or can be found using $(0, -ac^3 + d)$

$(x + 1)(x - 3)(2x - 1)$
$(0 + 1)(0 - 3)(2*0 - 1)$
$(1)(-3)(-1) = 3$
(0, 3)

Step 4 **Determine the relative minimum and maximum**

Use your calculator to find the relative minimum and maximum

Min: (2, -9)
Max: (-.33, 3.7)

Exercises

For questions 5-7, identify the domain, range, x-intercept and y-intercept of the absolute value function described by the equation shown below. Write the domain and range as intervals, and in set builder notation.

5. $f(x) = |x-2|+5$

6. $f(x) = -2|x+3|$

7. $f(x) = \frac{1}{3}|x|+4$

For questions 8-9, identify the domain, range, relative minimum, relative maximum, x-intercept and y-intercept of the absolute value function described by the equation shown below. Write the domain and range as intervals, and in set builder notation.

8. $f(x) = 2|x+1|-2$

9. $f(x) = -\frac{1}{2}|x-7|$

10. $f(x) = -|x-8|+6$