

7.6 Quadratic & Absolute Value Transformations

Warm-Up Wednesday

...in your notes

Quadratic Function: a function whose equation can be written:

$$f(x) = ax^2 + bx + c, \text{ where } a, b, c \text{ are real numbers and } a \neq 0.$$

The graph of a quadratic function is a parabola.

Example 1: Graph the following equations in the same window on your calculator:

$$y = x^2, \quad y = 2x^2, \quad y = \frac{1}{3}x^2 \text{ and } y = -4x^2$$

small \rightarrow wide

List the equations in order from widest to narrowest.




① $y = \frac{1}{3}x^2$ ② $y = x^2$ ③ $y = 2x^2$ ④ $y = -4x^2$

Negatives don't matter

7.6 Quadratic & Absolute Value Transformations

EQ: How do I find the transformations of a quadratic or absolute value function?

In general we can say that for the graph of $y = ax^2$:

- If $0 < |a| < 1$, the graph will be wider. (This is sometimes called a vertical compression.) 
- And if $|a| > 1$, the graph will be thinner. (This is sometimes called a vertical stretch.) 
- Also, if $a < 0$, the graph will be reflects over x-axis. 
negative

7.6 Quadratic & Absolute Value Transformations

EQ: How do I find the transformations of a quadratic or absolute value function?

(vertex)
The standard form of a quadratic function is

$$f(x) = a(x-h)^2 + k$$

The point (h, k) is the vertex of the parabola.

If the graph opens upwards, the vertex will be a minimum. If the graph opens downwards the vertex will be a maximum.

stretch/compression

$$f(x) = a(x-h)^2 + k$$

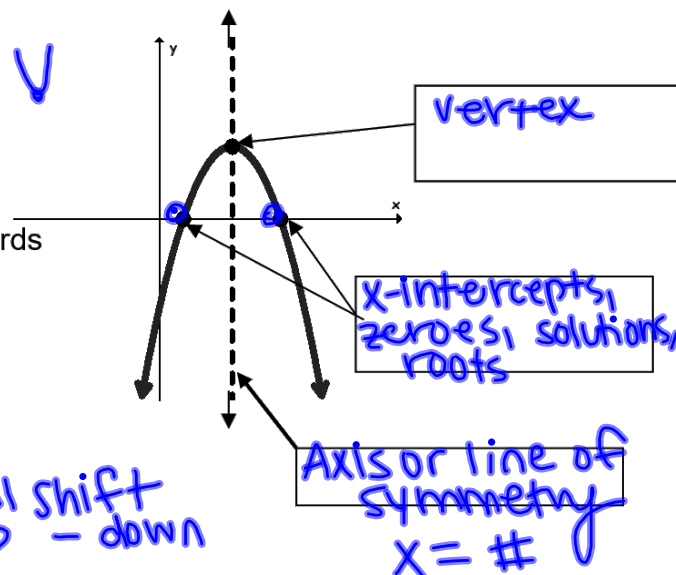
horizontal shift
+ left - right

vertical shift
+ up - down

Example

List the transformations of $f(x) = \frac{1}{2}(x-5)^2 + 7$ from the parent function.

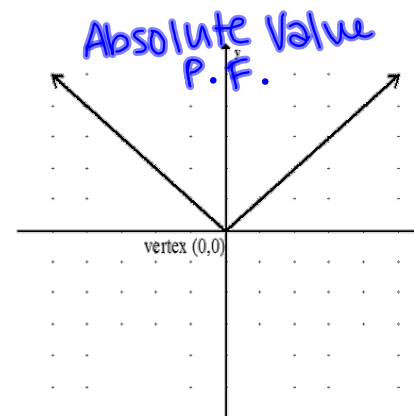
- Right 5
- up 7
- compression by $\frac{1}{2}$



7.6 Quadratic & Absolute Value Transformations

EQ: How do I find the transformations of a quadratic or absolute value function?

Absolute Value Function – a function whose equation can be written in the form $f(x) = a|x - h| + k$ where a , b , c are all real numbers. The graph of the parent function $f(x) = |x|$ is shown at the right.

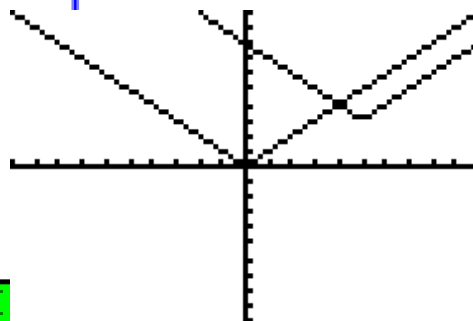
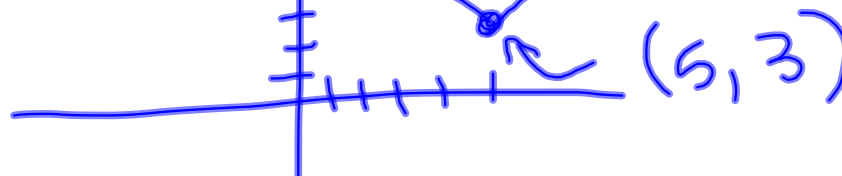


7.6 Quadratic & Absolute Value Transformations

EQ: How do I find the transformations of a quadratic or absolute value function?

Example 2: Sketch the graph of the function, $g(x) = |x - 5| + 3$ and label its vertex.

transformations 3 up
5 right



7.6 Quadratic and Abs. Value Transformations
Pre Cal

Name: _____

Describe in words how the parent graph, $f(x) = x^2$, is transformed into $g(x)$.

1. $g(x) = 2.8(x+16)^2 + 10$

2. $g(x) = -\frac{3}{10}(x-11)^2 + 6$

Describe in words how the parent graph, $f(x) = |x|$, is transformed into $g(x)$.

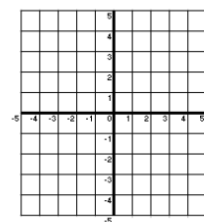
3. $g(x) = 7|x+2| - 5$

4. $g(x) = -\frac{1}{8}|x-3| + 4$

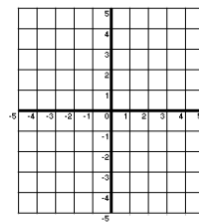
5. $g(x) = -|x+6| + 7$

#6-8 Sketch the graph of the function. Label each vertex.

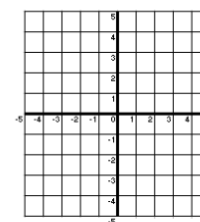
6. $f(x) = \frac{1}{5}(x+2)^2 - 4$



7. $g(x) = 3(x+1)^2 - 2$



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



9. Based on the description, write the equation in the form of $y = a \cdot f(x - c) + d$ for the parent graph, $f(x) = |x|$.

a.) The graph is reflected over the x-axis, widened by a factor of $\frac{1}{2}$, and translated 3 units to the right.

b.) The graph is narrowed by a factor of 3, translated 4 units to the left, and 8 units down.

10. Record the letters in order from narrowest graph to the widest.

A. $y = -2f(x)$ B. $y = \frac{1}{2}f(x)$ C. $y = 5f(x)$ D. $y = \frac{8}{3}f(x)$ E. $y = -\frac{1}{3}f(x)$

Describe in words how the parent graph, $f(x) = x^2$, is transformed into $g(x)$.

11. $g(x) = \frac{1}{5}(x-1)^2 + 3$

12. $g(x) = -7(x-11)^2 + 2$

Describe in words how the parent graph, $f(x) = |x|$, is transformed into $g(x)$.

13. $g(x) = \frac{1}{2}|x+4| - 9$

14. $g(x) = -5|x-3| + 4$

15. $g(x) = 2|x| - 7$

