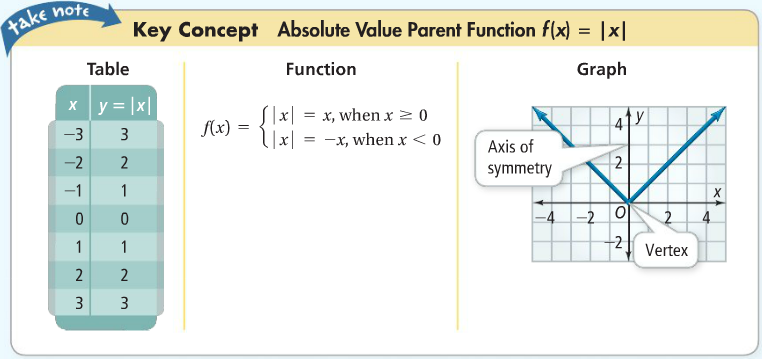
**Section 2–7: Absolute Value Functions and Graphs**

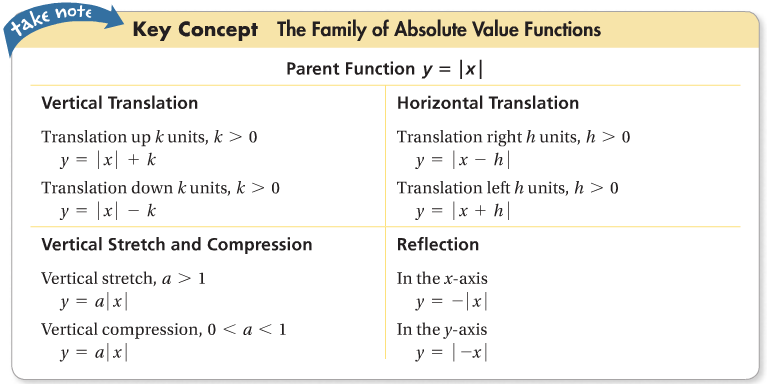
**Introductions:**

Just as the absolute value of *x* it its distance from 0, the absolute value of , or , gives the distance from the line for each value of .

The simplest example of an **absolute value function** is . The graph of the absolute value of a linear function in two variables is V-shaped and symmetric about a vertical line called the **axis of symmetry**. Such a graph has either a single maximum point or a single minimum point, called the **vertex**.



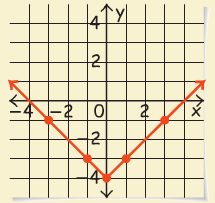
The transformations you studied in the last two lessons also apply to absolute value functions.



**Example 1: Graphing an Absolute Value Function**

What is the graph of the absolute value function ? How is the graph different from the graph of the parent function ?

|  |  |
| --- | --- |
| ***x*** | ***f*(*x*)** |
| –3 | –1 |
| –1 | –3 |
| **0** | –**4** |
| 1 | –3 |
| 3 | –1 |



Step 1: make a table of values

Step 2: **\***determine where the vertex is

Step 3: graph the function

**\*** You can determine where the vertex is by looking at the table of values and see where the values begin to turn.

**Example 2: Combining Translations**

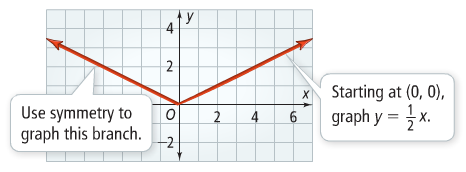
For this function, , identify the: (a) vertex, (b) axis of symmetry, and (c) transformation from the parent function .

1. the vertex of this function is
2. the axis of symmetry is ; the value is the same as the *x*-value from the vertex
3. the parent function is **translated left 2 units and up 3 units**.

**Vertical Stretch and Compression:**

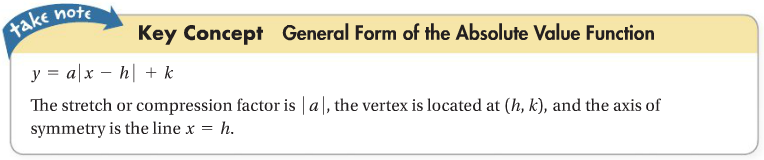
The right branch of the graph of has a slope of 1. The graph of , , is a stretch or compression of the graph of . Its right branch has a slope of . The graph of is a reflection of in the *x*-axis and its right branch has a slope of .

**Example 3: Vertical Stretch and Compression**

What is the graph of ?

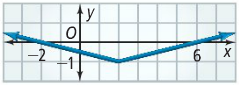
The graph is a vertical compression of the graph of by the factor of . Graph the right branch and use symmetry to graph the left branch.

You can combine the equations for stretches and compressions with the equations for translation to write a general form for absolute value functions.



**Example 4: Writing an Absolute Value Function**

What is the equation of the absolute value function?



**Step 1: Identify the vertex.**

The vertex is at , so and .

**Step 2: Identify .**

The slope of the branch to the right of the vertex is , so .

**Step 3: Write the equation.**

**Substitute the values of , , and into the general form .**

The equation that describes the graph is .