2.7 Use Absolute Value Functions and Transformations

TEKS a.3, 2A.4.A, 2A.4.B

Before You graphed and wrote linear functions.

Now You will graph and write absolute value functions.

Why? So you can model structures, as in Ex. 39.

Key Vocabulary
- **absolute value function**
- **vertex of an absolute value graph**
- **transformation**
- **translation**
- **reflection**

In Lesson 1.7, you learned that the absolute value of a real number x is defined as follows.

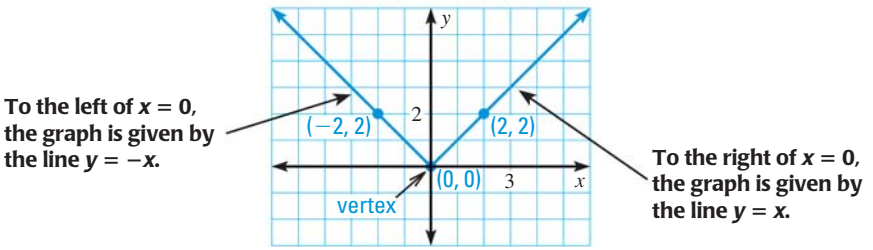
$$|x| = \begin{cases} x, & \text{if } x \text{ is positive} \\ 0, & \text{if } x = 0 \\ -x, & \text{if } x \text{ is negative} \end{cases}$$

You can also define an **absolute value function** $f(x) = |x|$.

KEY CONCEPT *For Your Notebook*

Parent Function for Absolute Value Functions

The parent function for the family of all absolute value functions is $f(x) = |x|$. The graph of $f(x) = |x|$ is V-shaped and is symmetric about the y-axis. So, for every point (x, y) on the graph, the point $(-x, y)$ is also on the graph.



The highest or lowest point on the graph of an absolute value function is called the **vertex**. The vertex of the graph of $f(x) = |x|$ is $(0, 0)$.

REVIEW GEOMETRY
For help with transformations, see p. 988.

TRANSLATIONS You can derive new absolute value functions from the parent function through *transformations* of the parent graph.

A **transformation** changes a graph's size, shape, position, or orientation. A **translation** is a transformation that shifts a graph horizontally and/or vertically, but does not change its size, shape, or orientation.

The graph of $y = |x - h| + k$ is the graph of $y = |x|$ translated h units horizontally and k units vertically, as shown in the diagram. The vertex of $y = |x - h| + k$ is (h, k).