Absolute Value Transformations

This lesson will go over the basic transformations of absolute value functions as well as the domain and range of certain absolute value function transformations.

Basic Transformations:

$y = |x - h|$ - The function MOVES h units to the RIGHT

$y = |x + h|$ - The function MOVES h units to the LEFT

$y = |x| + k$ - The function MOVES UP k units

$y = |x| - k$ - The function MOVES DOWN k units

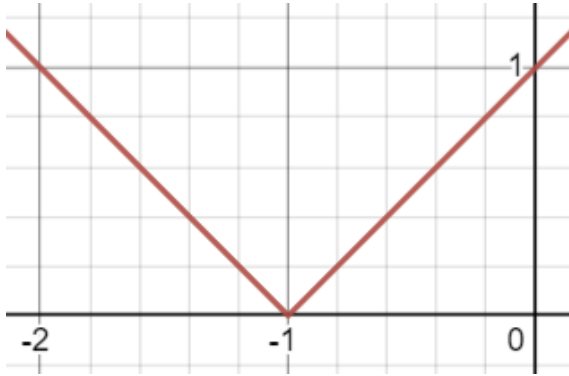$y = -|x|$ - The function is REFLECTED over the X-AXIS

The LARGER the number being multiplied by $|x|$, the NARROWER the function is.

The SMALLER the number being multiplied by $|x|$, the WIDER the function is.

Domain and Range of Graphs:

The domain for ANY absolute value graph, regardless of the transformations done on it is ALL REAL NUMBERS.

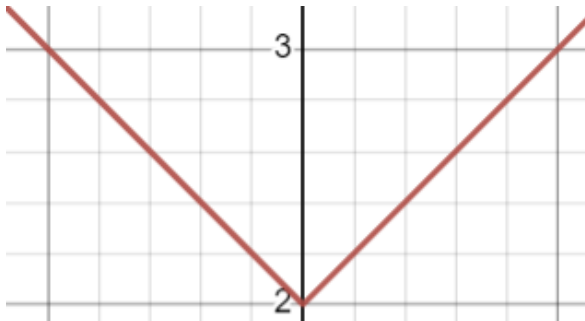$y = |x+1|$

The range of this function is $[0, \infty)$ - Includes 0 and approaches infinity but does not touch it.

The range of any absolute value function with a HORIZONTAL TRANSFORMATION is $[0, \infty)$.
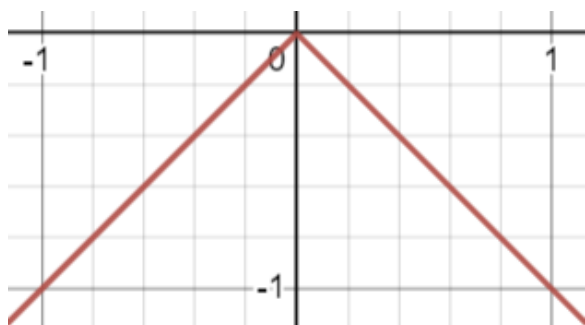
$y = |x| + 2$

The range of this function is $[2, \infty)$ - Includes 2 and approaches infinity but does not touch it.

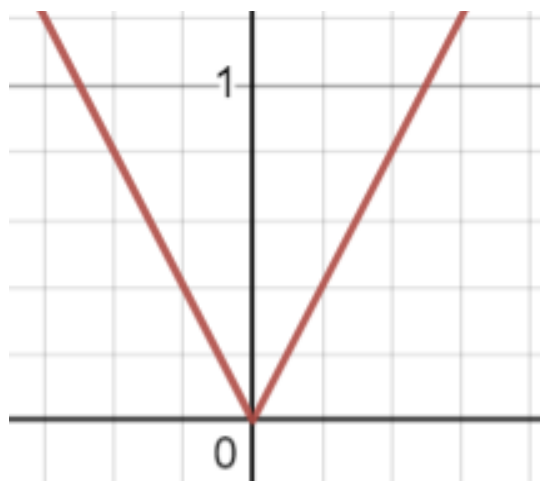The range of any absolute value function with a VERTICAL TRANSFORMATION of k units is [k, ∞).

y = -|x|

The range of this function is [0, -∞) - Includes 0 and approaches negative infinity but does not touch it.

The range of any absolute value function REFLECTED OVER THE X-AXIS is [0, -∞).

y = 2|x|

The range of this function is [0, ∞) - Includes 0 and approaches infinity but does not touch it.

The range of any absolute value function that is DILATED is [0, ∞).

Tips for Solving Problems:

1. Make sure you know the basic transformations and the domain (ALL REAL NUMBERS for all of them) and range of each one! These are important when you are asked to graph/analyze various absolute value functions.

2. The ONLY time an absolute value function will be BELOW the x-axis is when it is REFLECTED OVER THE X-AXIS. All other kinds of absolute value functions are above the x-axis because the absolute value is ALWAYS positive.

3. Vertical transformations depend on how much the absolute value function is shifted vertically. The number of units that the function shifts UP or DOWN determines the starting number of the function's range.