

3.6 – Absolute Value Functions

Learning Objectives

- 1 Solve an absolute value equation.
- 2 Graph an absolute value function.

1 – Solving an Absolute Value Equation

An **absolute value equation** is an equation in which the unknown variable appears in absolute value bars.

Solutions to Absolute Value Equations

For real numbers A and B , an equation of the form $|A| = B$, with $B \geq 0$, will have solutions when $A = B$ or $A = -B$. If $B < 0$, the equation $|A| = B$ has no solution.



HOW TO

Given the formula for an absolute value function, find the horizontal intercepts of its graph.

1. Isolate the absolute value term.
2. Use $|A| = B$ to write $A = B$ or $-A = B$, assuming $B > 0$.
3. Solve for x .

Example 1 – Solving an Absolute Value Equation

Solve the absolute value equation $|4x + 1| - 7 = 0$.

Solution:

2 – Graphing an Absolute Value Function

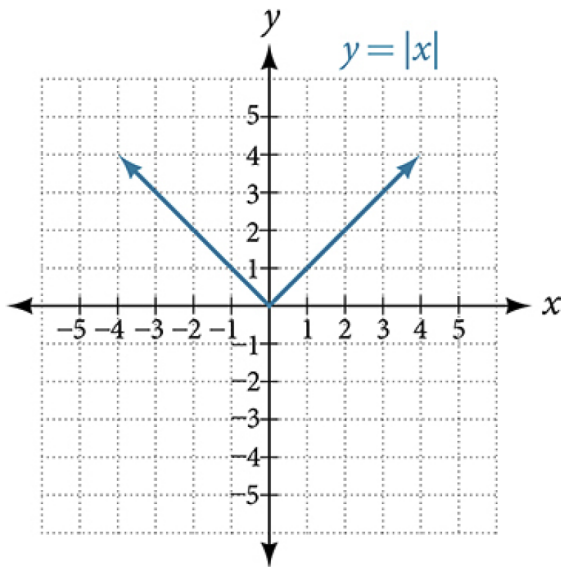
Recall that in its basic form $f(x) = |x|$, the absolute value function is one of our toolkit functions.

The absolute value function can be defined as a piecewise function.

The domain is $(-\infty, \infty)$ and the range is $[0, \infty)$.

$$f(x) = |x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

Graph of $y = |x|$



Example 2 – Graphing an Absolute Value Function

Sketch a graph of the function $f(x) = -|x - 2| + 3$. Label all intercepts on your graph. State the domain and range.

Solution:

$f(x) = |x|$ EVEN or ODD?

The absolute value function is symmetric about the y -axis, so it is an even function. We can use this fact to graph absolute value functions of the form $f(x) = a|x \pm c| + k$.

Example 3 – Graphing an Absolute Value Function

Sketch a graph of the function $f(x) = 2|x - 3| - 4$. Label all intercepts on your graph. State the domain and range.

Solution: