

### 3.6 – Absolute Value Functions

#### Understanding Absolute Value

Recall that in its basic form  $f(x) = |x|$ , the absolute value function is one of our toolkit functions. The absolute value function is commonly thought of as providing the \_\_\_\_\_ the number is from \_\_\_\_\_ (the origin) on a number line.

#### A GENERAL NOTE: ABSOLUTE VALUE FUNCTION

The absolute value function can be defined as a piecewise function

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

#### Example

Students who score within 20 points of 80 will pass a test. Write this as a distance from 80 using absolute value notation.

#### Graphing an Absolute Value Function

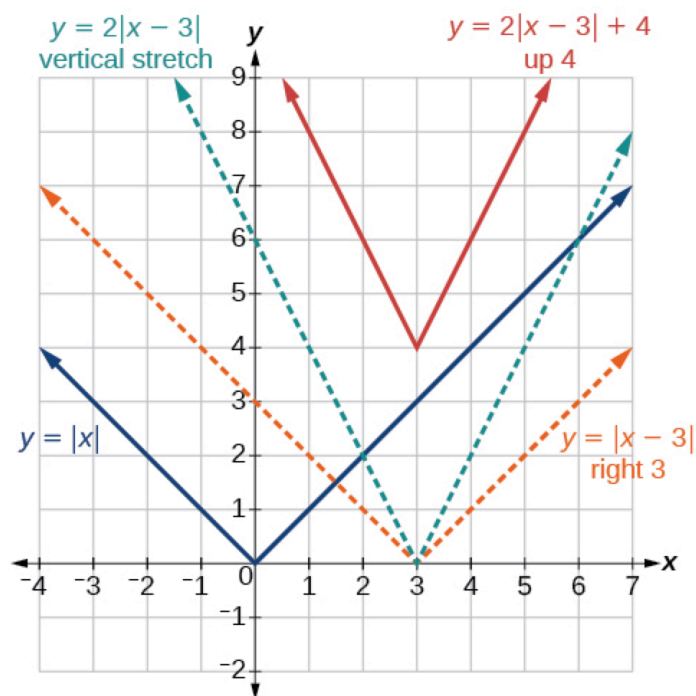


Figure 3.

## Examples

a.

Write an equation for the function graphed in [Figure](#).

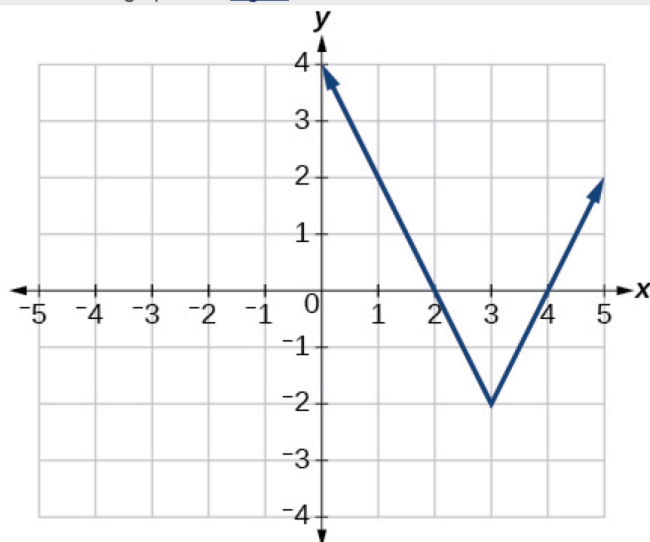


Figure 4.

b.

Write the equation for the absolute value function that is horizontally shifted left 2 units, is vertically flipped, and vertically shifted up 3 units.

## A GENERAL NOTE: 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

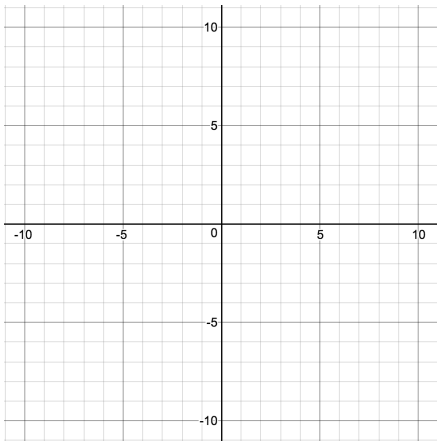
**Given the formula for an absolute value function, find the horizontal intercepts of its graph.**

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

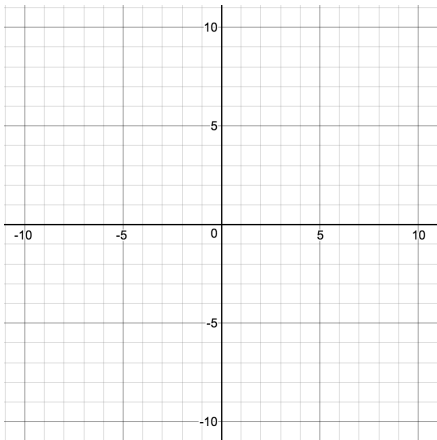
## Example

### Finding the Zeros of an Absolute Value Function

- a. For the function  $f(x) = |4x + 1| - 7$ , find the values of  $x$  such that  $f(x) = 0$ .



- b. For the function  $f(x) = |2x - 1| - 3$ , find the values of  $x$  such that  $f(x) = 0$ .



## Q&A

Should we always expect two answers when solving  $|A| = B$ ?

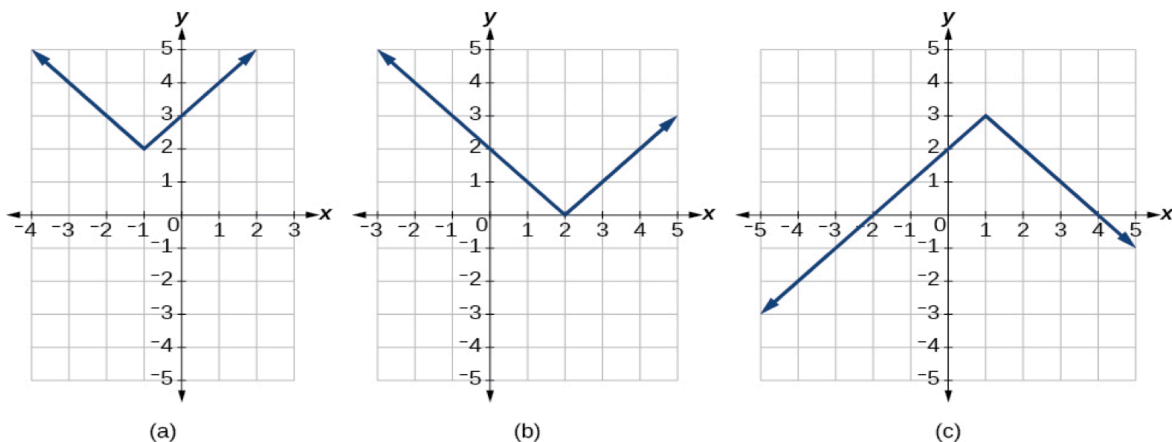


Figure 5. (a) The absolute value function does not intersect the horizontal axis. (b) The absolute value function intersects the horizontal axis at one point. (c) The absolute value function intersects the horizontal axis at two points.