Section 0.1

"Before Calculus" Functions

All graphics are attributed to:

- *Calculus,10/E* by Howard Anton, Irl Bivens, and Stephen Davis

Definition of a Function

- You may remember from earlier courses that a function exists when each x value has one y value.
- You can also recognize a function from the graph by using the vertical line test.
- Remember, x is always the independent variable (values make up the domain) and y is the dependent variable (values make up the range).

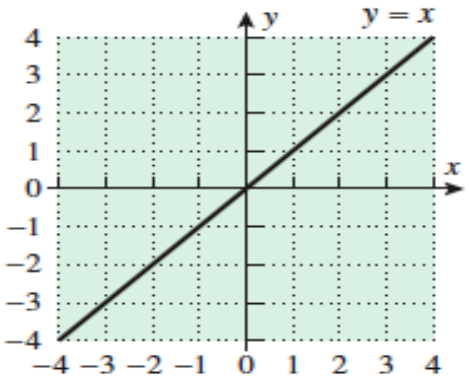
0.1.1 DEFINITION If a variable y depends on a variable x in such a way that each value of x determines exactly one value of y, then we say that y ***is a function of*** x.

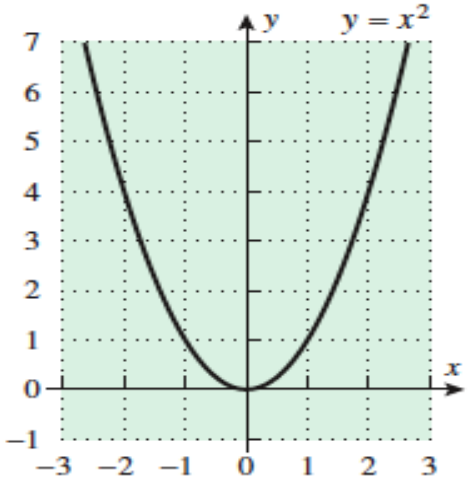
Definition 0.1.1 (p. 1)

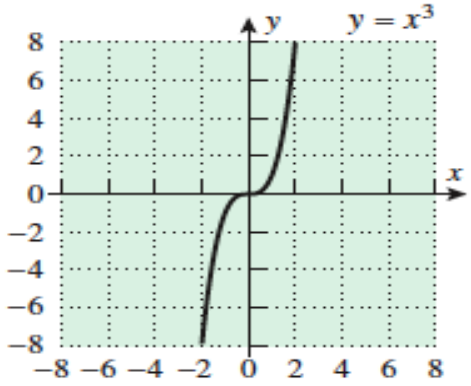
0.1.2 DEFINITION A ***function*** f is a rule that associates a unique output with each input. If the input is denoted by x, then the output is denoted by $f(x)$ (read "f of x").

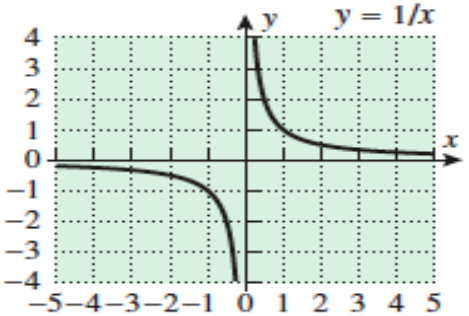
Definition 0.1.2 (p. 2)

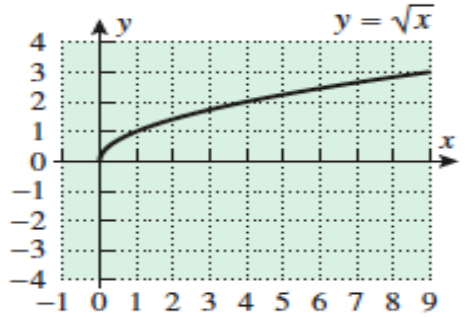
The following are all functions

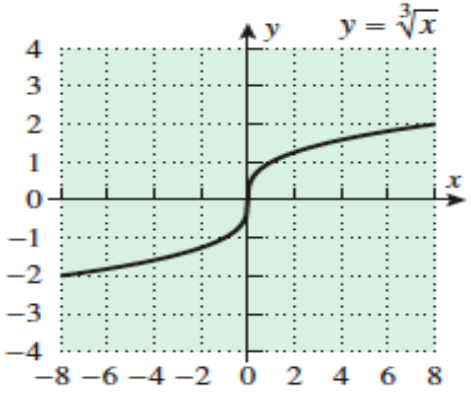




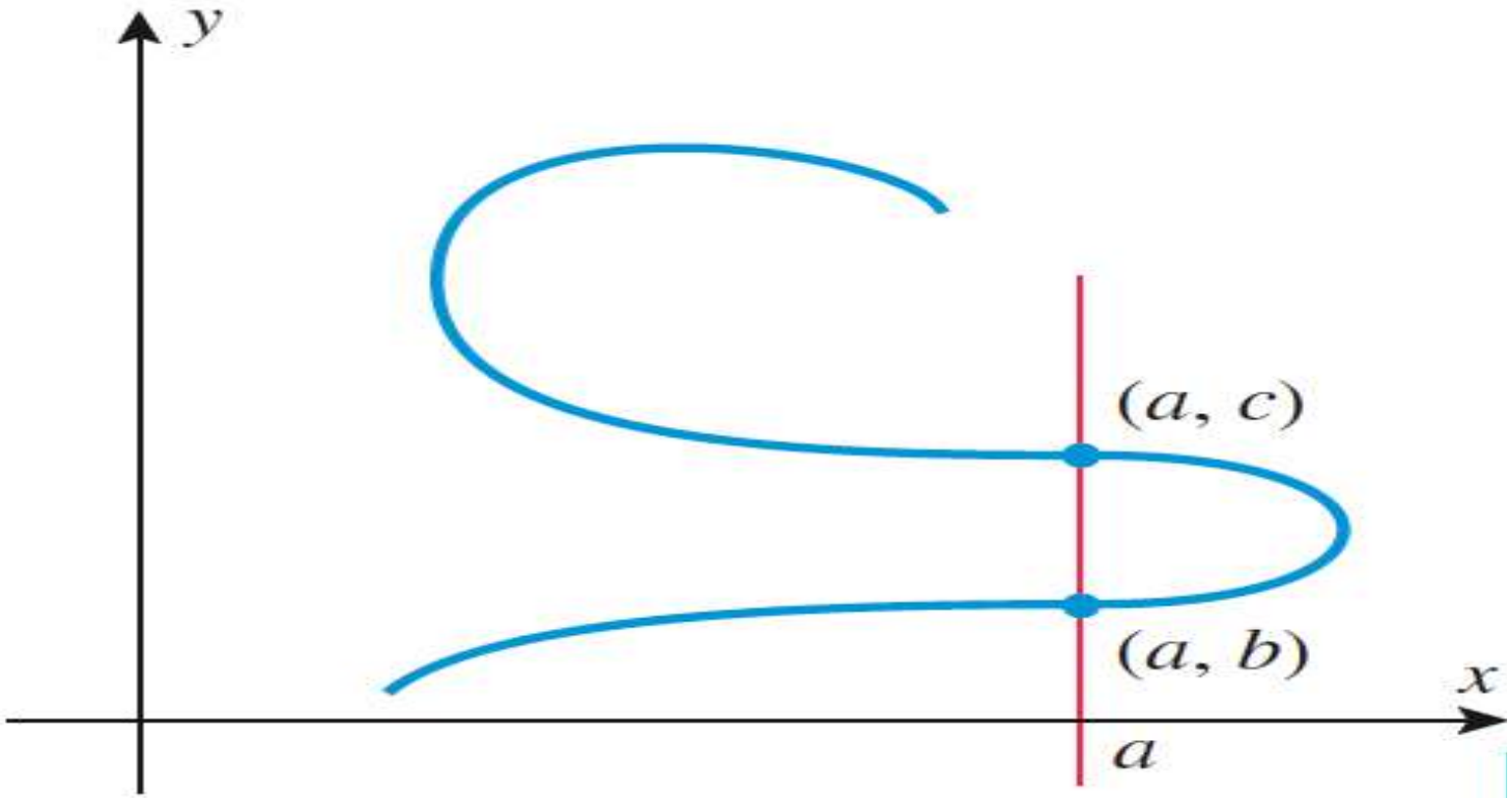






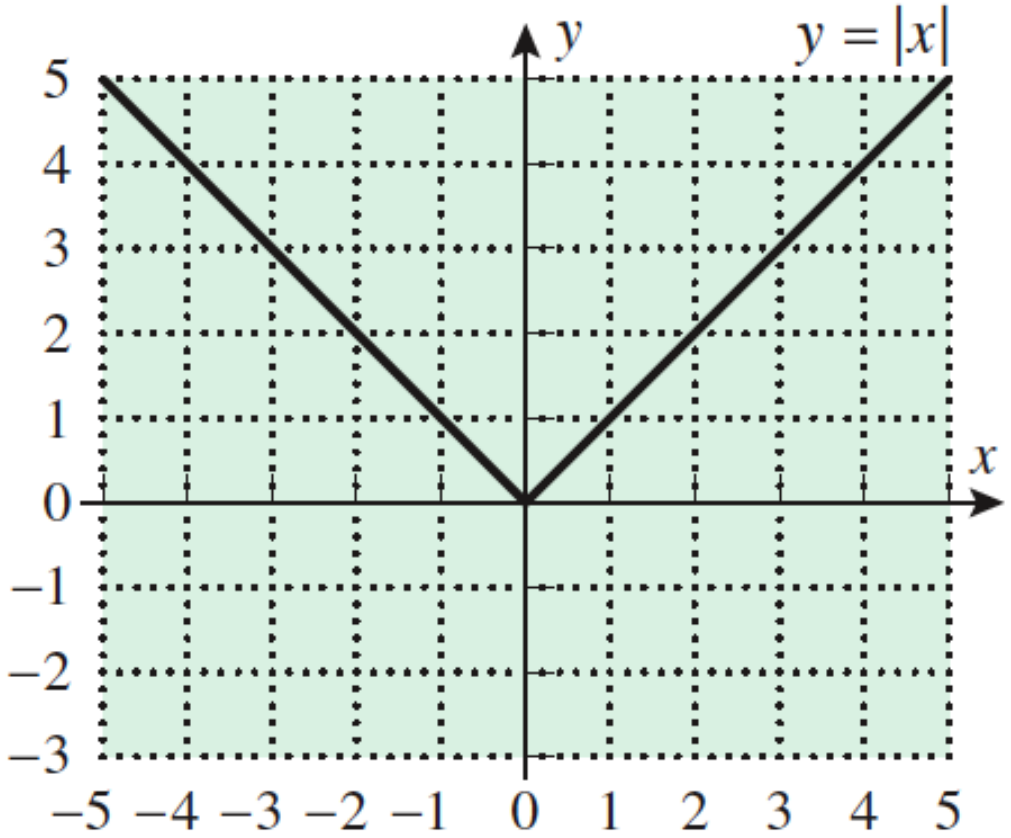


This is not a function because it fails the vertical line test at x=a and other x values.



The Absolute Value Function – measures distance from the origin

- You may remember graphing y = IxI.



- Each x has only one y and it passes the vertical line test, so it is a function.

- We will use the following properties of absolute value throughout the year, especially a & b.

0.1.4 PROPERTIES OF ABSOLUTE VALUE *If a and b are real numbers, then*

(a)	$\lvert -a\rvert = \lvert a\rvert$	A number and its negative have the same absolute value.
(b)	$\lvert ab\rvert = \lvert a\rvert\,\lvert b\rvert$	The absolute value of a product is the product of the absolute values.
(c)	$\lvert a/b\rvert = \lvert a\rvert/\lvert b\rvert,\ b \neq 0$	The absolute value of a ratio is the ratio of the absolute values.
(d)	$\lvert a+b\rvert \leq \lvert a\rvert + \lvert b\rvert$	The ***triangle inequality***

Piecewise-Defined Functions

- The absolute value function f(x) = |x| or y = |x| is an example of a piecewise function because the formula changes depending upon the value of x. On the left side, the equation is $y = -x$ where $x < 0$. On the right side, the equation is $y = x$ where $x > 0$. They are pieces of two functions combined together in your graph with a breakpoint at x=0.
- See page 6 in your book for more examples.

Domain and Range in Applied Problems

- Physical considerations often impose restrictions on the domain and range of a function.
- Read ex. 9 & 10 on pgs 9 & 10 in your book and we will discuss them more next class.