Notes Section 1.3 B – Function Basics

Lesson Objectives

1. The basics of function
2. Function notation
3. Understand the relationship between function notation and its graph
4. Determine whether a relation is a function
5. Evaluate a function from a formula or a graph
6. Determine the domain and range of a function

A. Functions – The Basics

Ways to **Represent** a function

1. _____ – a formula (equation)
2. _____ – a table of values
3. _____ – a visual display of points
4. _____ – a description in words

The variables of a function

- The set of all valid _____ for a function is called the _____, and the input variable is called the _____ variable - _____.
- The set of all valid _____ for a function is called the _____, and the output variable is called the _____ variable - _____.

B. Function Notation – the symbolic representation

Function notation looks like this: _____ and is read as "***y* equals *f* of *x*.**"
The reverse is also true: $f(x) = y$
It does **NOT** mean _____! (It is NOT "*f* times *x* equals *y*.")
Another way: ***f*(input) = output**
The **name** of the function is ***f***, but a function can be called $g(x)$ or $h(x)$, etc.

C. Function Notation and its Graph: *f*(Input) = Output

When evaluating a graphically, first locate the **input** value on the _____, then determine the corresponding **output** value on the _____.

- **EXAMPLE:** If $f(-5) = 3$, identify a point on the graph of f. (Type an ordered pair.) [1.3.23]

  - The number in **parentheses** is the _____, and the number **by itself** is the _____.
  - Together, they make the ordered pair, or the point, _____.
  - So, if $f(-5) = 3$, that means a point on the graph of f is _____.

Notes Section 1.3 B – Function Basics

- **EXAMPLE:** If (5,27) lies on the graph of *f*, then *f*(_____) = _____. [1.3.25]

  - This is the reverse idea of the previous example.
  - Any point in the graph of a function can be written in function notation.

- **EXAMPLE:** A function g is defined as follows: $g(-4) = -6$, $g(0) = -9$, $g(4) = -4$, $g(8) = -6$
  (a) Write *g* as a set of ordered pairs.
  (b) Give the domain and range of *g*.

  [1.3.47]

  [solution] **(a)** *g* = { _____ }
  (b) D = {_____} and R = {_____}

D. Function – special kind of relation (set of ordered pairs)

Each element in the domain corresponds to exactly one element in the range.
A function can only have one output for each input.
The _____-coordinates cannot _____ in a function.

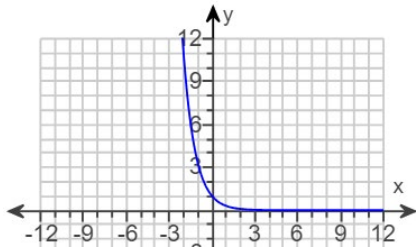
- **EXAMPLE:** Determine whether the relation *S* is a function. [1.3.107]
  S = { (a,5), (b,5), (c,9), (d,5), (e,5) }.

  - Each *x*-coordinate is unique; none of the *x*-coordinates repeat.
  - _____ – the relation _____ a function (Doesn't matter if *y*-coordinates repeat)

_____ _____ _____ – used to tell if a graph is a function

- Scan with a vertical line from left to right along the graph
- Must maintain EXACTLY _____ point of contact throughout the scan.
  - If it maintains **exactly one** point of contact, then _____, it's a function
  - If it makes **two or more** points of contact at any moment, then _____, it's not a function.

- **EXAMPLE:** Is the relation a function? [1.3-45]



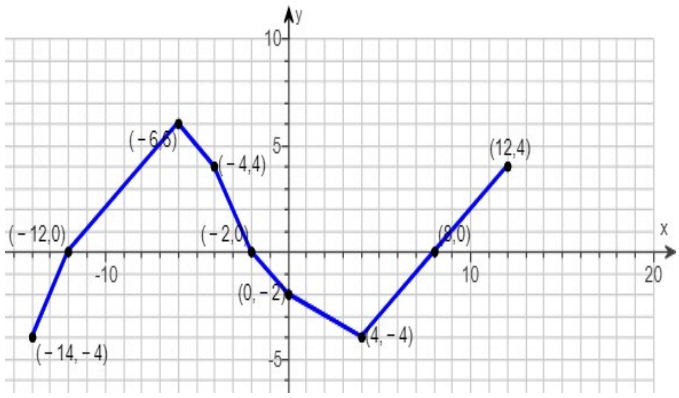
Although the left side looks like it's going vertical, in reality, it's not.

Notes Section 1.3 B – Function Basics

E. Evaluate a Function from its Graph

- **EXAMPLE:** [*Consortium 3.1.12]

Use the graph of the function *f* shown to the right to answer parts **(a)** through **(d)**.



(a) Find $f(-14)$.
The number in parentheses is always the **___-coordinate**. So, $f(-14)$ means find the **___-coordinate** that goes with $x = -14$.
The graph contains the point (– 14,___), so
Find *y* in (– 14, *y*) $f(-14) =$ _____.

(b) Find $f(-6)$.
The graph contains the point (– 6,____), so
Find *y* in (– 6, *y*) $f(-6) =$ _____.

(c) Find $f(12)$.

The graph contains the point (12,____), so
Find *y* in (12, *y*) $f(12) =$ _____.

(d) For what number(s) of *x* is $f(x) = -4$?

This problem is different – the number in parentheses, *x*, is not given.
***f*(*x*)** is another name for ____, so $f(x) = -4$ really means that ***y*-coordinate** is _____.
The graph contains the point (____, – 4), so
Find *x* in (*x* , – 4) So, *x* = _____

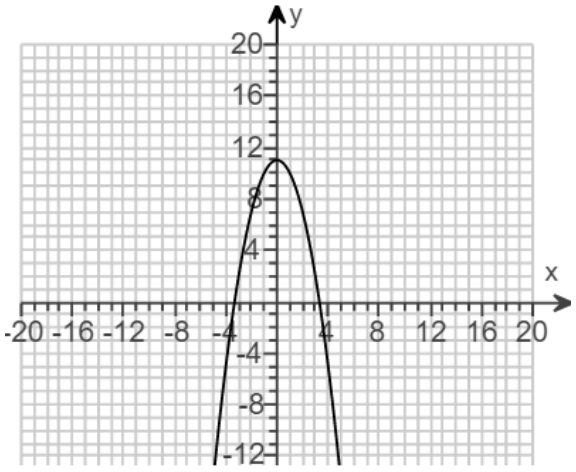
F. Determine Domain and Range of a Function in a Graph

- **EXAMPLE:** Use the graph of the function *f* to estimate its domain and range.
  Evaluate $f(0)$. [1.3.73]

Assume graph goes on forever, unless it has a big fat dot or open dot (endpoint).
Domain: all the ***x*-coordinates** shown in graph.
Domain is ___, and it moves _____ – to – _____.
(Answer) The domain is: _____

Range: all the ***y*-coordinates** shown in graph.
Range is ____, and it moves _____ – to – _____.
(Answer) The range is: _____

Use _____ for range because 11 is **included**.



Evaluate $f(0)$.
That's the point
_____

Find *y* in (0, *y*)
(Answer)
$f(0) =$ _____

Notes Section 1.3 B – Function Basics

G. Evaluate a Function from its Formula

- **EXAMPLE:** Given that $f(x) = |2x - 8| + 7$, find $f(3)$. [*Akst Appendix.G-28]

$f(3)$ means find ___ when ____ $= 3$. Plug $x = 3$ into the function formula.

Remember to always use _____ to avoid messing up.

$$f(x) = |2x - 8| + 7$$

$$f(3) = |2(\_\_\_\_) - 8| + 7$$

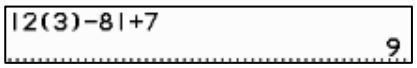
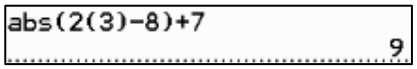
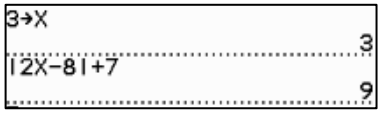
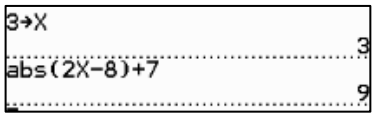
$$f(3) = |\_\_\_\_ - 8| + 7$$

$$f(3) = |\_\_\_\_| + 7$$

$$f(3) = \_\_\_\_ + 7 = \_\_\_\_$$

By the way – together, that makes the point on the graph: (___, ____)

There are two main ways you can do this on calculator:

<table>
<tr>
<td colspan="2">1. Direct Substitution
To get absolute value bars, press MATH, →, ENTER
  </td>
<td colspan="2">2. “Go to the STO”
You are going to store the number 3 for the variable x.
Press: 3 ; STO> ; X,T,θ,n ; ENTER
  </td>
</tr>
<tr>
<td>(from TI-84 Plus)
 
(from TI-83 Plus)
  </td>
<td colspan="2">Type in your function formula
$|2x - 8| + 7$
as is, press ENTER.
Use variables – don’t plug in anything.</td>
<td>(from TI-84 Plus)
 
(from TI-83 Plus)
  </td>
</tr>
</table>

(go on to the next page)

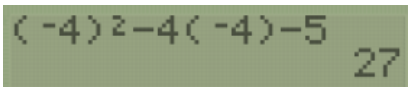
Notes Section 1.3 B – Function Basics

- **EXAMPLE:** Find $f(-4)$ when $f(x) = x^2 - 4x - 5$. [1.3-12]

$f(-4)$ means find ____ when ____ = – 4. Plug $x = -4$ into the function formula.
Remember to always use _____ to avoid messing up.

$$f(x) = x^2 - 4x - 5$$
$$f(-4) = (\_\_\_)^2 - 4(\_\_\_) - 5$$
$$f(-4) = \_\_\_\_\_ \quad \_\_\_\_\_ - 5$$
$$f(-4) = \_\_\_\_\_ - 5 = \_\_\_\_\_$$

There are two main ways you can do this on calculator:

1. Direct Substitution	2. "Go to the STO"	
	Press **(–)**; **4** ; **STO>** ; **X,T,θ,n** ; **ENTER**  Type in your function formula **$x^2 - 4x - 5$** as is, press **ENTER**. Use variables – don't plug in anything.	

Sources used:

1. Pearson MyLab Math *College Algebra with Modeling and Visualization, 6th Edition*, Rockswold
2. Pearson MyLab Math *Consortium: MIA: Intro to Algebraic, Graphical, & Numerical Problem Solving, 6th Edition*.
3. Pearson MyLab Math *Developmental Mathematics through Applications, 1st Edition*, Akst.
4. Wabbitemu calculator emulator version 1.9.5.21 by Revolution Software, BootFree ©2006-2014 Ben Moody, Rom8x ©2005-2014 Andree Chea. Website https://archive.codeplex.com/?p=wabbit