CARE Math 115 Exam 1 Review

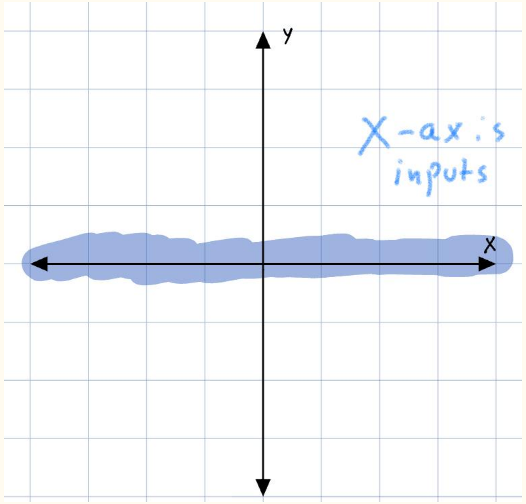
Good luck on your test!

Learning Goal 1: Functions

Functions

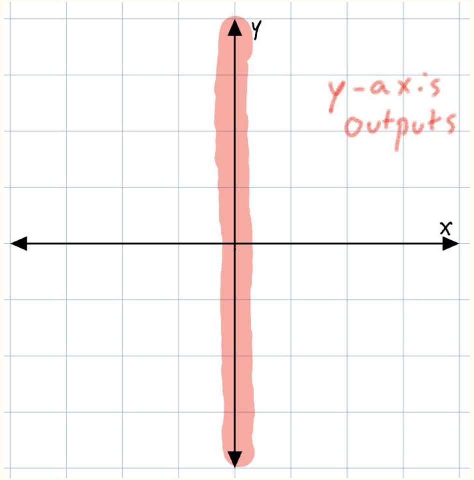
<u>Domain:</u> the set of a function's possible inputs (think x values)

<u>Example:</u> You are desperate for a coffee from Espresso Royale. You tell the cashier your order and hand them your money. The money is the **INPUT**



<u>Range:</u> the set of all possible outputs (or y values)

<u>Example</u>: After handing in your money and waiting for your order. You are than handed your custom coffee. The coffee is the **OUTPUT**

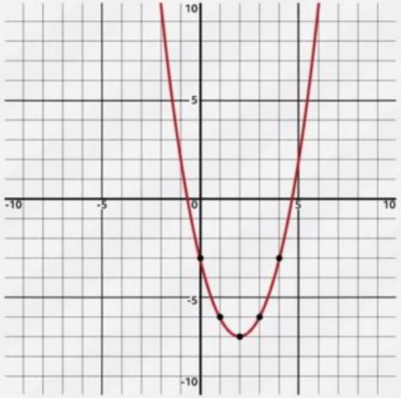


Finding domain and range

Algebraically:

Think about what numbers you can plug in for x and the resulting numbers you will get for y

With a graph:



Use graph to visualize which x- and y-values are covered

With a table:

x	y
7	13
14	27
21	41
28	55
Domain	Range

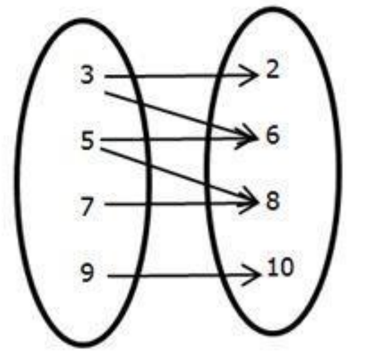
What makes a function?

<u>Function</u>: is a relationship between two sets of numbers which can often be expressed using coordinates, (x, y) . A function requires that each x value is assigned to ONLY ONE y value.

Basically, if you are looking at a graph and see x values being repeated, then it is not a function. Y values can be repeated

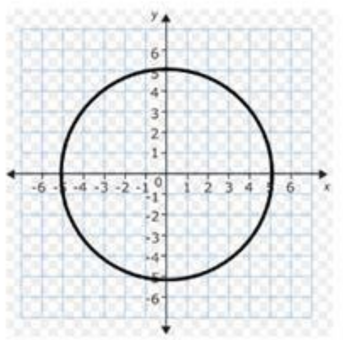
Not A Function

I.



Not A Function

II.



III.

x	1	3	5	7
y	-6	-18	-30	-42

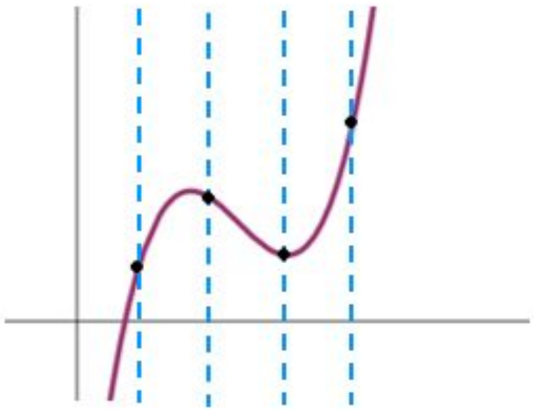
Function

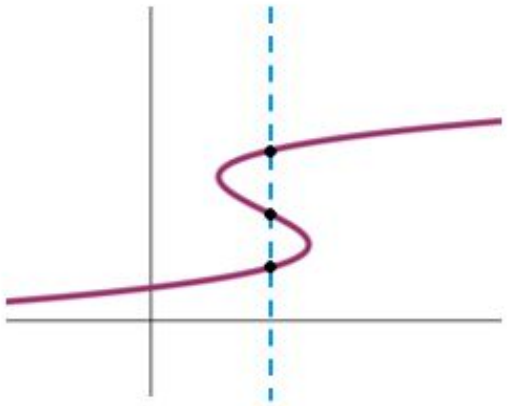
IV. {(-2, 3), (-1, 4), (0, 4), (3, 2)}

Function

Vertical Line Test

A graph represents a function if there are no vertical lines that intersect the graph at more than one point.





Is a Function

No vertical line will cross the graph more than once.

NOT a Function

There is a vertical line that crosses the graph more than once.

Difference Quotient

The difference quotient is a part of the definition of the derivative of a function

Goal: Plug the given function into the f(x) and f(x+h) into the formula and eliminate the h located in the denominator.

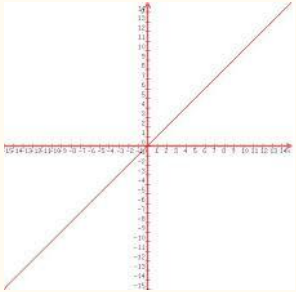
Difference

$$\frac{f(x+h)-f(x)}{h}$$

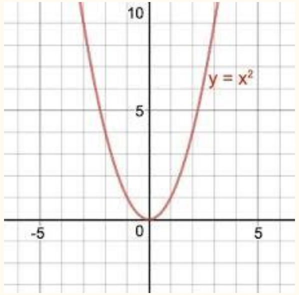
Quotient

Learning Goal 2: Transformations

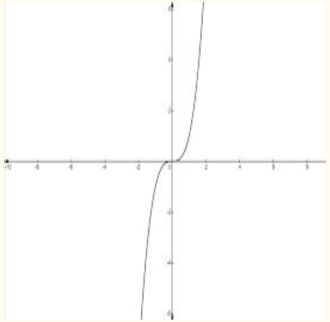
Types of Parent Functions



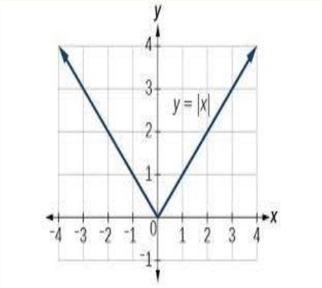
Linear



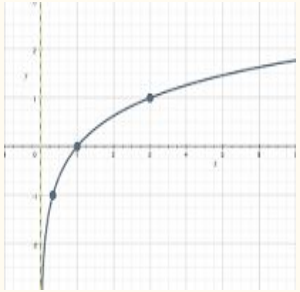
Quadratic



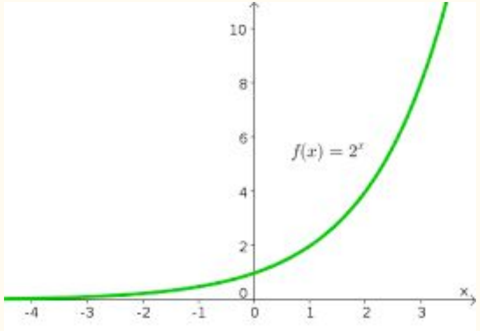
Cubic



Absolute Value



Logarithmic



Exponential

Transformations of Graphs of Functions

There are multiple ways to transform functions. A few examples are

-Horizontal/ Vertical Translation

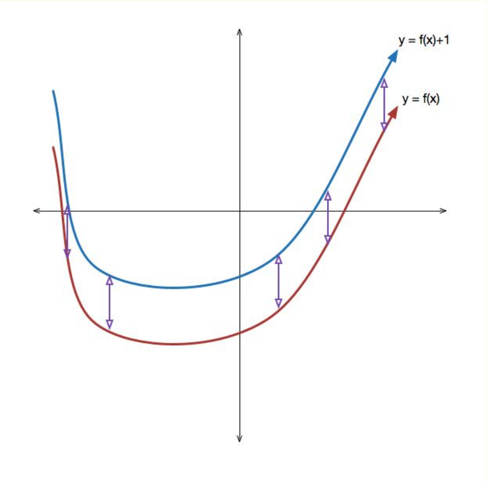
-Horizontal / Vertical Reflection

-Compressing/ Stretching

Linear Exponential Cubic Absolute Value Logarithmic

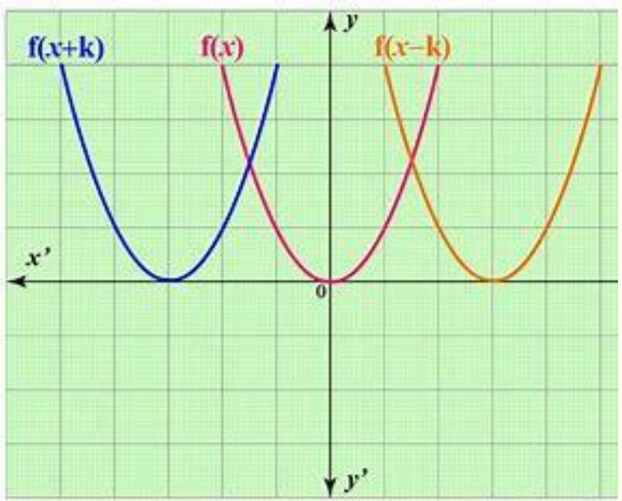
Vertical / Horizontal Translation

To move a function up or down, we need to add to the outside of the function **f(x) + d i**s the graph of f(x) shifted up by d units



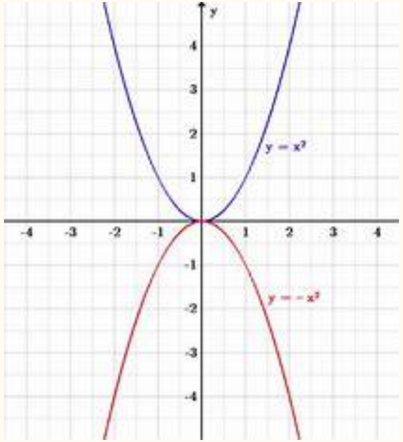
To move a function right or left, we subtract to the inside of the function f(x-k) is the graph of f(x) shifted right by k units

The function f(x+k) is the graph of f(x) shifted left by k units

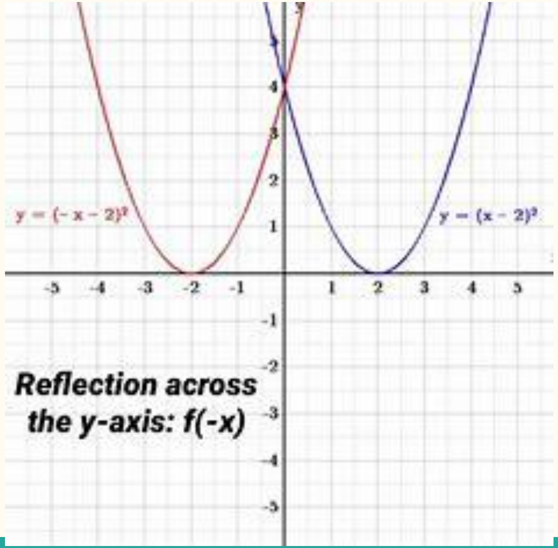


Vertical/ Horizontal Reflection

Given a function f(x), a new function g(x)=-f(x) is a **vertical reflection** of the function f(x), sometimes called a reflection about the x-axis



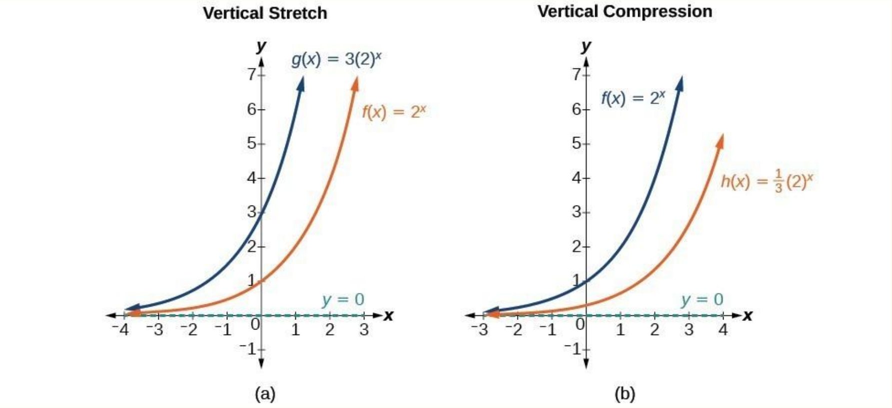
Given a function f(x), a new function g(x) = f(-x) is a **horizontal reflection** of the function f(x), sometimes called a reflection about the y-axis



Compressing/ Stretching

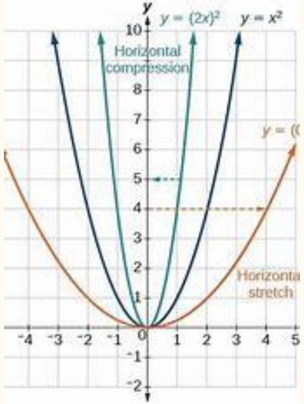
If we multiply a function by a coefficient, the graph of the function will be stretched or compressed

Vertical compression: $f(x)$ if $g(x)=Cf(x)$



Horizontal compression: $f(x)$ if $g(x) = f(Cx)$ and $C>1$

Horizontal stretch: $f(x)$ if $g(x) = f(Cx)$ and $0<C<1$



Learning Goal 3: Sequences

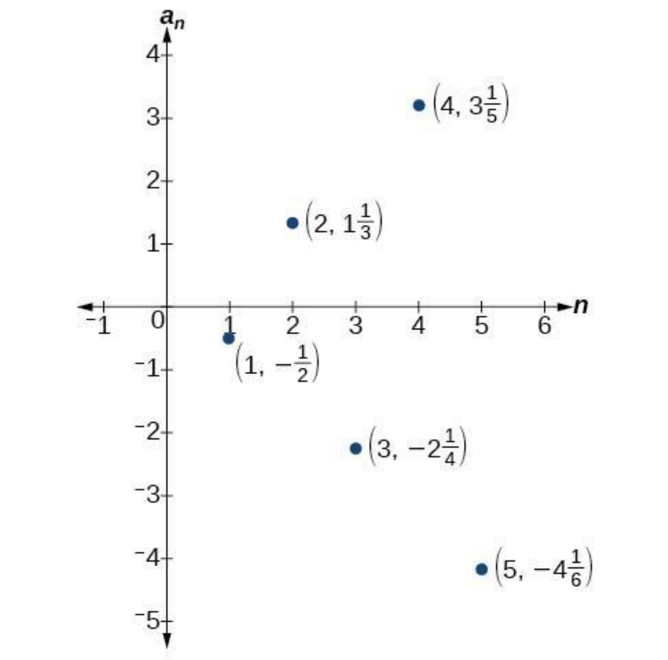
What is a Sequence?

$$a_1, a_2, a_3, a_4, a_5, a_6, \ldots$$

As a more concise representation, we can express the general sequence above as $\{a_n\}$. Also, we can reference the *n*th term of the sequence as just a_n. Thus, for instance, given the sequence 1, 2, 3, 4, 5, 6,..., which we might call $\{a_n\}$, the *n*th term is simply *n*. (The sixth term, a_6, is 6, for example.)

Properties applied to sequences

- Alternating Series
- Strictly Increasing
- Strictly Decreasing
- Bounded from above
- Bounded from below
- Convergent
- Divergent



Alternating/Increasing/Decreasing

Alternating set:

{2, -4, 6, -8, 10} **Usually denoted by** $(-1)^n$ $(-1)^{n-1}$

Strictly Increasing Set:

{0, 2, 4, 5, 6,...}

Strictly Decreasing Set:

{100, 50, 25, 12.5, ...}

Bounds (above/below)

Bounded from above: There exists a number M such that all terms in the sequence are less than or equal to M. (Upper bound)

$$\left\{2, 0, 3, 0, 4, 0, 1, -\frac{1}{2}, -\frac{1}{3}, -\frac{1}{4}, \ldots\right\}$$

Bounded from below: There exists a real number M such that all terms in the sequence are greater than or equal to M. (Lower Bound)

$$\{121, 80, 500, 0, 342, 3, 9\}$$

Convergence/ Divergence

Convergence: Used to help find a limit; one in which the sequence approaches a finite, specific value

$$\{1, \tfrac{1}{2}, \tfrac{1}{4}, \tfrac{1}{6}, 1/12, 1/14\}$$

Divergence: Used to help find a limit; one in which the sequence does not approach a finite, specific value

$$\{1, 2, 3, 4, 5, 6, \ldots\}$$

How to solve a Limit Law equation

$$\lim_{n\to\infty} \frac{6n^4 + 3n^2 - 1}{20 + 3n - 2n^4}$$

1. Look at the denominator and find the leading term (variable that has the highest exponent
2. Multiply the inverse of that of term (1/n)
3. Apply to limit to all terms in the sequence
4. Cancel our 0s where needed

$$\lim_{n\to\infty} \frac{1}{n} = 0$$

Thank you for your time, we will now be walking around to answer questions