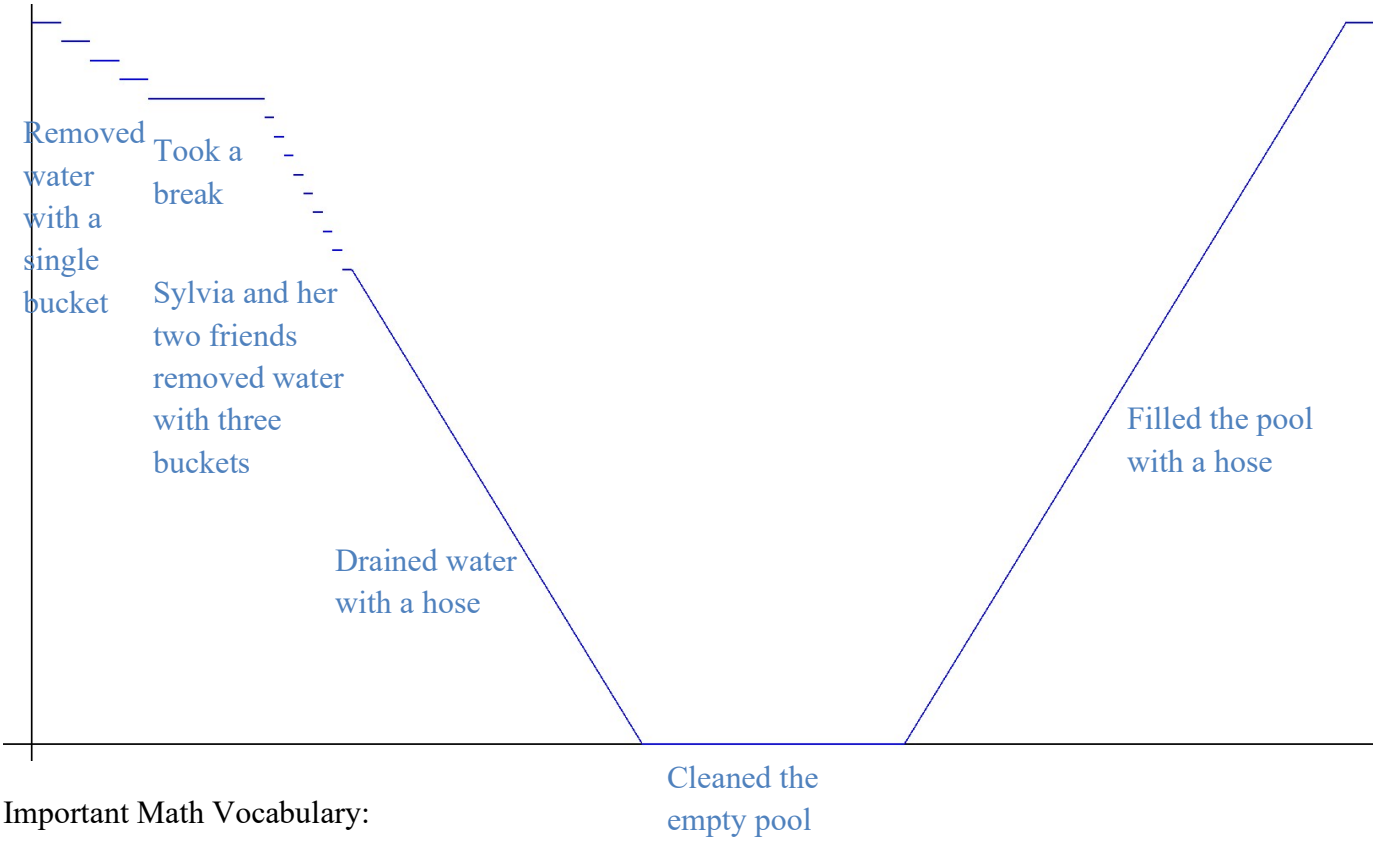
Lesson 3.1 Notes

Sylvia has a small pool full of water that needs to be emptied and cleaned, then refilled for a pool party. During the process of getting the pool ready, Silvia did all of the following activities, each during a different time interval.

Removed water with a single bucket	Filled the pool with a hose (same rate as emptying pool)
Drained water with a hose (same rate as filling pool)	Cleaned the empty pool
Sylvia and her two friends removed water with her three buckets	Took a break

1) Sketch a possible graph showing the height of the water level in the pool over time. Be sure to include all of the activities Sylvia did to prepare the pool for the party. Remember that only one activity happened at a time. Think carefully about how each section of your graph will look, labeling where each activity occurs.



Important Math Vocabulary:

- Increasing – the function increases as you read from left to right.
- Decreasing – the function decreases as you read from left to right.
- y-intercept – the place where the graph crosses the y-axis.
- x-intercept(s) – the place(s) where the graph crosses the x-axis.
- Rate of Change (Slope) - $\frac{\Delta y}{\Delta x}$. This is a measure of how steep the graph is, or how quickly it is increasing or decreasing.
- Maximum – the largest y-value the graph ever reaches.
- Minimum – the smallest y-value the graph ever reaches.
- Domain – x-values of the graph.
- Range – y-values of the graph.

2) Create a story connecting Sylvia's process for emptying, cleaning, and then filling the pool to the graph you have created. Do your best to use appropriate math vocabulary.

The y-intercept represents the beginning of our situation at time zero when the water level in the pool started at the maximum value (the pool is full). Sylvia started removing the water with a bucket. This caused the water level to decrease discretely. Sylvia took a break while she waited for her friends to show up to help. The water level in the pool remained constant while she took a break. Sylvia and her two friends removed water with three buckets. This caused the water level in the pool to decrease discretely, but at a quicker pace than Sylvia removing water with a bucket by herself. They decide to drain the remaining water with a hose, which causes the water level to continuously decrease at a constant slope until the water level in the pool is at zero (its minimum value). The water level remains at a constant zero while the empty pool is cleaned. The x-intercepts occur while the water level is at zero. The water level increases continuously at a constant slope as the pool is filled with a hose. When the pool is full, the water level again reaches a maximum value.

What is a **function**?

A function is a relation for which each value from the set the first components of the ordered pairs is associated with exactly one value from the set of second components of the ordered pair.

Basically, this just says we cannot have multiple y-values associated with the same x-value.

An easy way to test for this on a graph is to use the vertical line test.

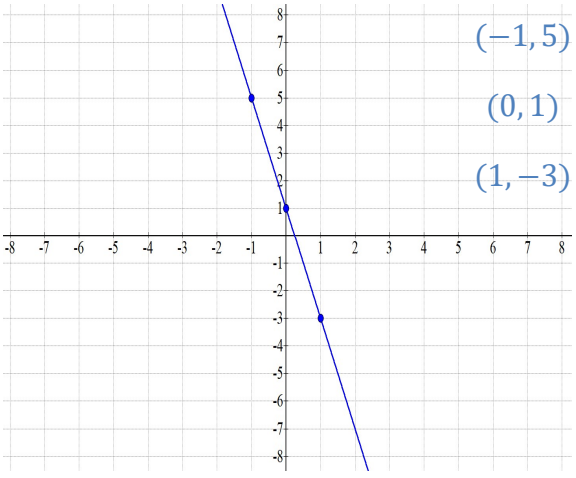
3) Does your graph represent a function? Why or why not? Would all graphs created for this situation represent a function?

My graph represents a function. Every point in time (x-value) is associate with one, and only one, water level (y-value). All graphs created for this situation should represent a function because the pool cannot have two different water levels at the same time.

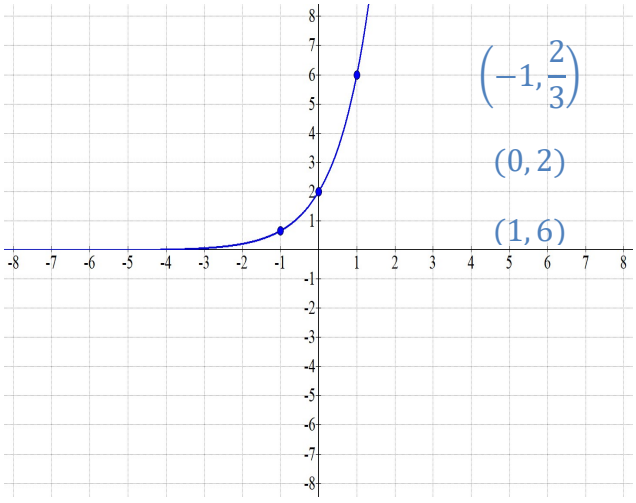
Other important notes from today:

Graph each function. Name three points that lie on each graph. Make sure all three of the points that you name are shown on your graph.

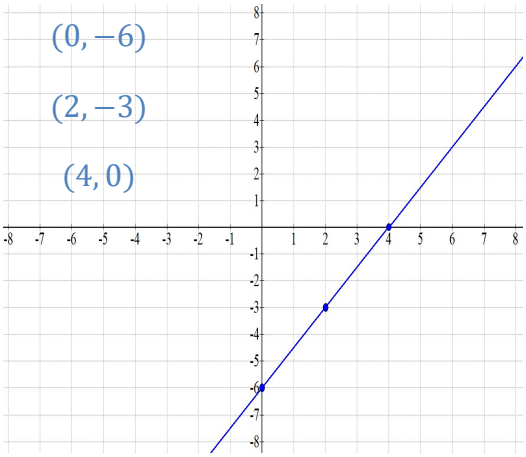
1) $f(x) = 1 - 4x$



2) $g(x) = 2(3)^x$

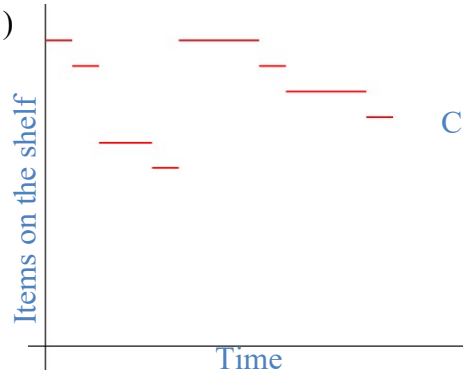


3) $h(m) = 1.5m - 6$

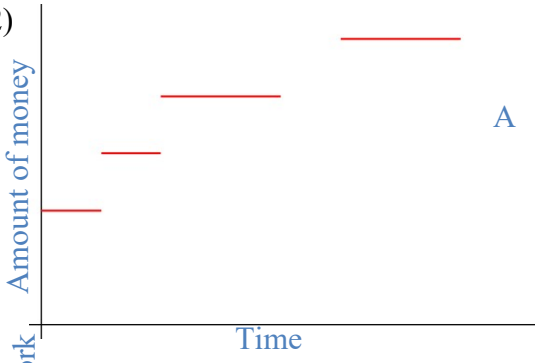


For each graph given match it to the contextual description that fits best. Then label the independent and dependent axis with the proper variables.

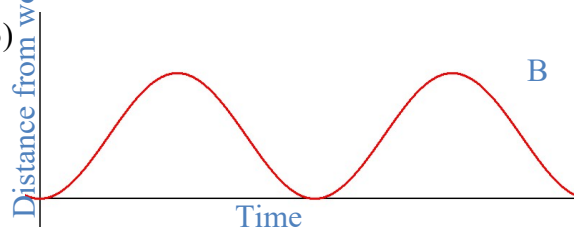
1)



2)



3)

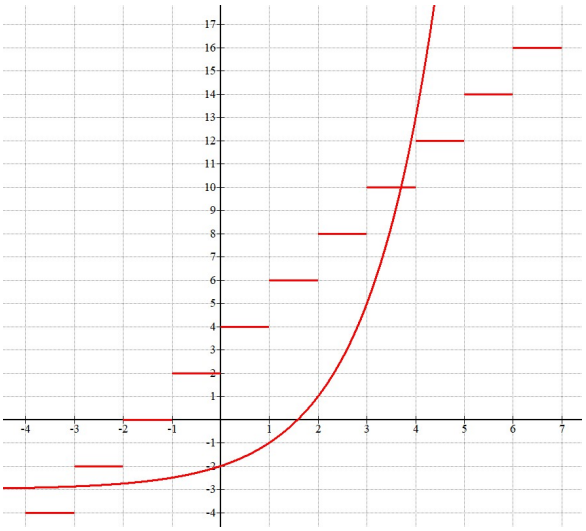


a. The amount of money in a savings account where deposits are made on a semi-regular basis.

b. The distance from work of a delivery driver as they make two trips to the same location.

c. The number of items on a shelf in grocery store.

Given the pair of graphs on the coordinate grid, create a list of similarities and differences between the two graphs. Consider attributes like continuous, discrete, increasing, decreasing, linear, exponential, intercepts, restrictions on domain or range, etc.



Similarities:

Both functions are increasing.

The domain of both functions is $(-\infty, \infty)$.

Differences:

One is discrete, the other is continuous.

The discrete function is linear in nature while the continuous function is exponential.

The range of the discrete function is integers while the domain of the continuous function is all real numbers greater than -3.

For each equation find the value of x that makes it true.

1) $8x + 5 = 6x + 11$

$-6x \quad -6x$

$2x + 5 = 11$

$-5 \quad -5$

$2x = 6$

$\frac{}{2} \quad \frac{}{2}$

$x = 3$

2) $2^x + 15 = 79$

$-15 \quad -15$

$2^x = 64$

**Now we make a table of values and try to find the exponent that gives us a value of 64.

x	y
0	1
1	2
2	4
3	8
4	16
5	32
6	64

$x = 6$

3) $8 = -6 - 2x$

$+6 \quad +6$

$14 = -2x$

$\frac{}{-2} \quad \frac{}{-2}$

$-7 = x$

4) $44 = -20 + 4^x$

$+20 \quad +20$

$64 = 4^x$

**Now we make a table of values and try to find the exponent that gives us a value of 64.

x	y
0	1
1	4
2	16
3	64

$x = 3$