

**Algebra I**  
**Lesson 5.3 – Rate of Change and Slope**  
**Mrs. Snow, Instructor**

Dollars per gallon, miles per hour, degrees per hour, cost per iTunes, and so on. What are all of these types of relationships known as? They are known as a **rate of change**. In algebra, more specifically linear functions, we use rate of change all the time. Our hot-air balloon problem that we talked about in each of the previous sections had a rate of change. The balloon rose in elevation *at a rate of 2 feet per second*.

**Vocabulary:**

**Rate of change** – is a ratio that compares the amount of change in a dependent variable to the amount of change in the independent variable. As you can see there are several ways to write this:

$$\text{rate of change} = \frac{\text{change in dependent variable}}{\text{change in independent variable}} = \text{slope} = \frac{\Delta y}{\Delta x} = \frac{\text{rise}}{\text{run}}$$

**Slope** – a constant rate of change; the graph is a line. The ratio of the rise to run for any two points on the line.

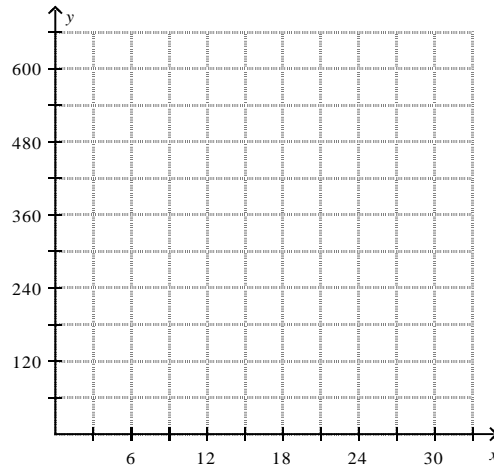
**Rise** – the difference in the **y-values** of two points.

**Run** – the difference in the **x-values** of two points

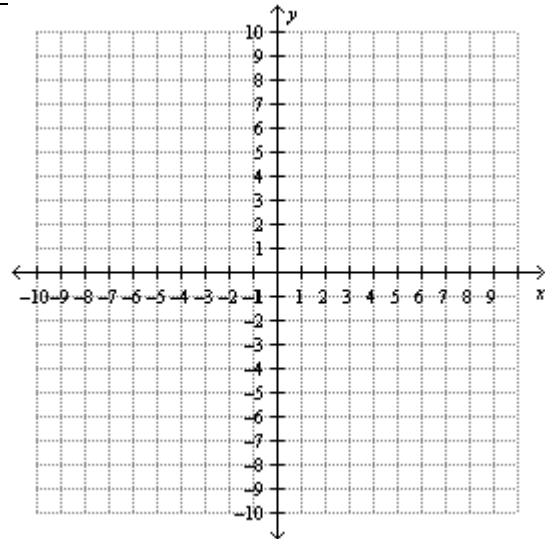
The main thing we need to be able to do is to identify the dependent and independent variables. The table below shows the balance of a bank account on different days of the month. Find the rate of change during each interval. During which interval did the balance decrease at the greatest rate? (*which variable is independent?*)

<b>Day</b>	1	6	16	22	30
<b>Balance (\$)</b>	550	285	210	210	175

Graph the table and show the rates of change. *Look for the rise/run.* Why does the graph only show quadrant I?

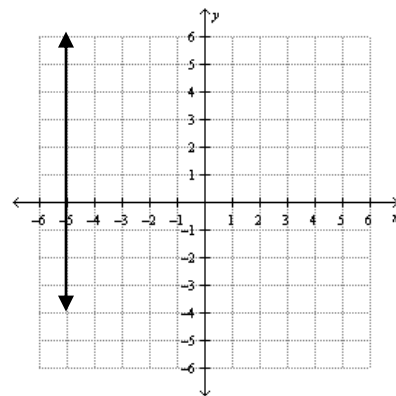
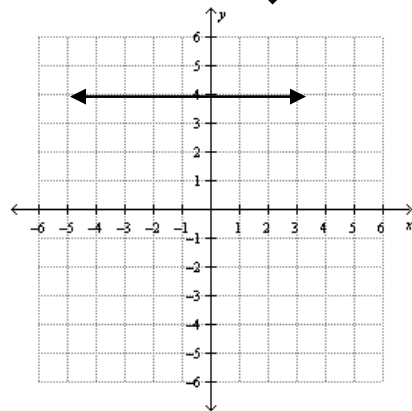
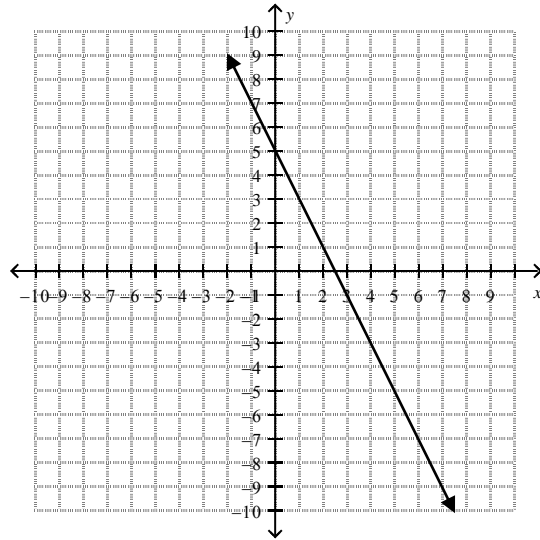
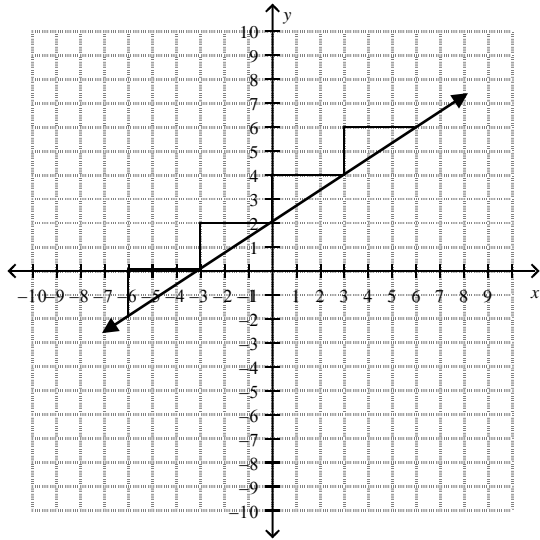


Graph  $3x - y = 1$  What is the rate of change? Is it constant? What does the graph look like? (*make a table of values!*)

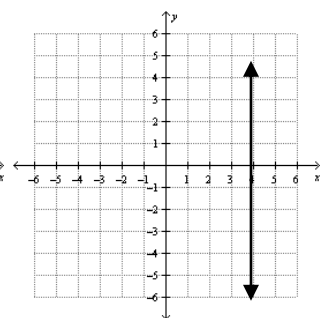
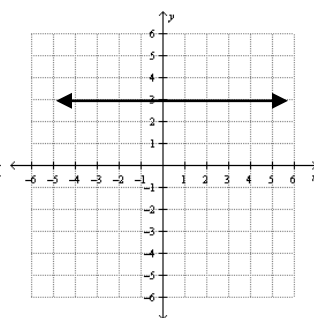
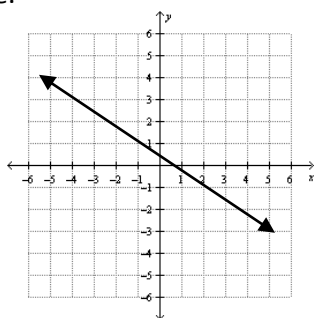
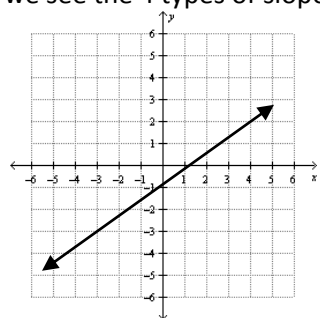


OH!! When the rate of change is constant we get a graph that is a line! So, when we have an equation that graphs out as a line, the rate of change between points is called the **slope**. To find the slope either on a graph or a table of numbers always remember it is the change between the y's over the change between x's  $\frac{\Delta y}{\Delta x}$ . Think about going up stairs. You raise your foot first, and then you move it over the step. **Rise over run**.

What is the slope of the line?  $\frac{\Delta y}{\Delta x}$



We have seen several different slopes. Slope may be positive, negative, zero, or even undefined. In summary we see the 4 types of slope.



**Positive slope:**  $\frac{+}{+}$

**Negative slope:**  $\frac{-}{-}$

**Horizontal:** zero slope

**Vertical:** no slope/  
undefined