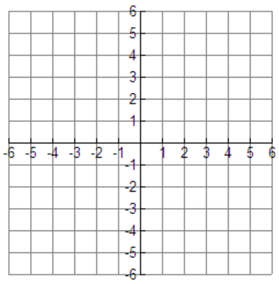
Average Rate of Change

To find the **average rate of change** between two points, compute the slope of the line that would connect the two points.

The following example does not require a calculator.
EXAMPLE 1 Find the **average rate of change** of the function $y = x^2 - 4 \ on \ [-2,1]$.



a) Graph $y = x^2 - 4$
Substitute in -2 and 1 into the x of your function to find the y-values and make sure that these points are part of your parabola

b) Draw a line that connects the two points. Does it have positive slope or negative slope?

C) Compute the slope using the slope formula. ________________=______.

Does this numerical answer confirm your answer in part b? If not, recheck your algebra.
The number that you have just found is the **average rate of change** of $y = x^2 - 4 \ on \ [-2,1]$.

In the following example a graphing calculator may be used.
Example 2 Find the average rate of change on the function $y = -x^3 - 2x^2 + 7x - 5 \ \ on \ [-3,2]$
a) Substitute in -3 and 2 into the x of your function to find the y-values and use these points to compute the slope using the slope formula.

b) Using the graphing calculator, look at the graph and see if your answer is consistent with the answer in part a. Sketch a picture of the graph along with the line that connects the two points. The line that connects the two points is called a **secant line** to the graph.

Example 3- You are going on a trip north to Atlanta and when you get in your car (t=0) you notice that the odometer reads that you have 20,300 miles already on your car. At the end of your 4.5 hour trip, your odometer reads 20,585. You know that you were mostly on the interstate, but had to stop and slow down during the construction issues on I-65 and when the drivers in front of you did not know how to go up a hill.

a)What is your average rate of change (average velocity/speed) during your trip? **(D=RxT so use this to find the rate)

Can you use this average rate of change to tell how fast you were going when you passed the 2nd Saraland exit?

Function Notation

f(2) reads "f of 2" and it means to substitute 2 into the variable of the function to find the y-value. The 2 and its y-value make a point.

Example 4

Find f(2) if $f(x) = x - 3$.

$f(2) = 2 - 3 = -1$ and there is a point on the function $(2, -1)$

Example 5 *(Work this one)*

Find f(5) if $f(x) = \sqrt{x+4}$

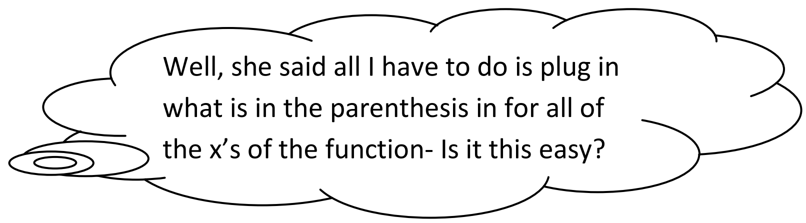
Example 6

Find f(d) if $f(x) = x^2 - 7x + 3$

$f(d) = d^2 - 7d + 3$, so there would be a point $(d, d^2 - 7d + 3)$ on the function. Don't be scared of letters!

Example 7 (Fill in the blanks for this one)

Find $f(x+h)$ for the function $f(x) = x^2 - 2x + 1$



$f(x+h) = (\qquad)^2 - 2(\qquad) + 1$

Now square out the binomial and collect like terms

$f(x+h) =$

Example 8

Sometimes we will denote average rate of change using function notation. Find the average rate of change of f(x) on [-4,7] using function notation.

Answer $\dfrac{f(7) - f(-4)}{7 - (-4)}$. If we knew the function, we could actually find the y-values and find the true slope.

Example 9

Find the average rate of change for f(x) on [x,x+h] using function notation