Calculus Unit 3
Average Rates & Values
Practice #2

Name _____
Date _____
Period _____

1. Find the average rate
2. Find the instantaneous rate
3. Find the area of the shape
4. Find the average value
5. State where that happens (x,y)

*Note: if you do not have access to a TI89 or wolfram, still write out the equation you would use to solve parts 4 & 5

$1.\ y = x^3 + x \quad from \quad [1,7]$

$2.\ y = 6x - x^2 \quad from \quad [-2,1]$

$3.\ y = \sin(x) \quad from \quad [0,5.4]$

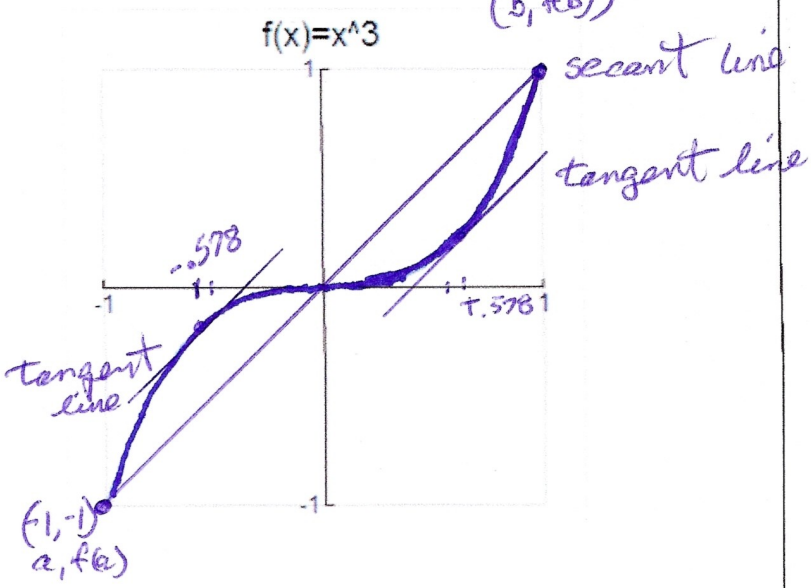
$4.\ y = \cos(x) \quad from \quad [0,5.4]$

$5.\ y = e^x \quad from \quad [0,10]$

Sample Problem:

imagine the following function: $f(x) = x^3$ for the interval $-1 \le x \le 1$

What does that look like graphically?



1. find average rate: MEAN VALUE THEOREM

$\frac{f(b)-f(a)}{b-a}$ = secant line = $\frac{1-(-1)}{1-(-1)} = \frac{2}{2} = 1$ slope of secant line is 1

2. find the instantaneous rate: find the point where slope is 1

$f(x) = x^3$

$f'(x) = 3x^2$ $\quad f'(c) = \frac{1}{3} = \frac{3x^2}{3}$

$\frac{1}{3} = x^2$ $\quad x = \pm\sqrt{\frac{1}{3}}$ $\quad x \approx \pm .578$

look at graph this makes sense. there are 2 places which have slope of 1!

3. find the area of the shape:

use $\int_{-1}^{1} x^3$ to find area. use WOLFRAM OR TI89 and type $\int_{-1}^{1}(x^3, x, -1, 1)$ hit enter area = 0

this makes sense, just as much + area and negative area, this shape is symmetrical about the x-axis.

4. find the average value:

$\frac{1}{b-a}\int_{-1}^{1} x^3$ and we saw area = 0 $\quad \frac{0}{1-(-1)} = \frac{0}{2} = 0$

now where does average value of 0 happen?

5. where does the happen (x,y):

again use wolfram or TI89 to solve

type this solve($x^3 = 0, x$) and hit enter

$x = 0$. again this makes sense, at (0,0) the average is same above and below.