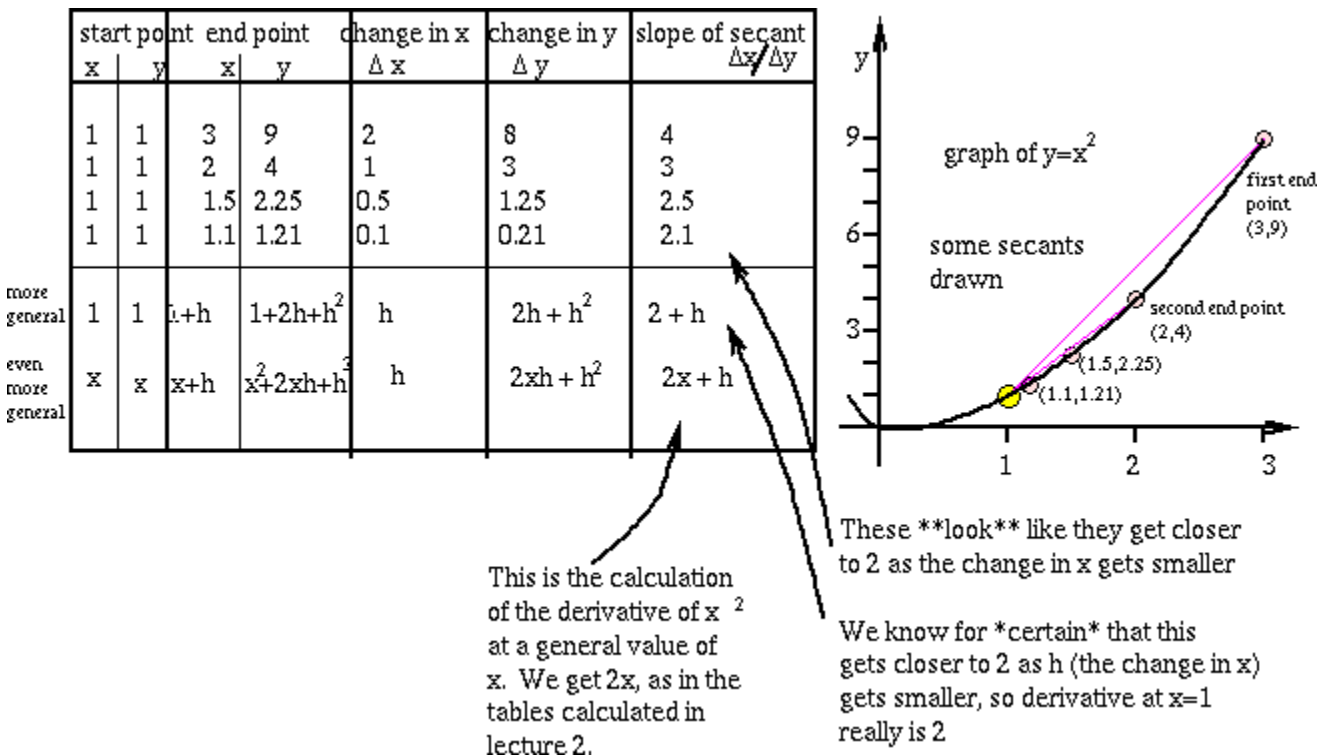


- **Derivatives** Formulas for finding derivatives more quickly: power rule, sum rule, difference rule, product rule, quotient rule, chain rule. higher order derivatives

Main Part of class

Last time we looked at finding derivatives by "guessing" what a sequence of numbers was getting closer to; the number we get closer and closer to is called the **Limit**.

Example:



This time we look briefly at how to be certain about what the limit is, using algebraic methods, which is shown in the last two lines of the above table.

Note, you will not be examined on finding a limit in this algebraic manner, but you will be expected to know what a limit is, and give an estimate of what the limit is from a sequence of values in a table.

Rules for finding derivatives

You should understand how to find the derivative as the limit of the slopes of tangents, just as you should understand what multiplication really means. But you don't have to think about the meaning of multiplication every time you pick up your calculator, and in the same way, you don't always need to go through the process of writing a table to find a derivative. We'll list some rules you should learn how to use.

Rule	Formula	Example	
		f(x)	f'(x)
constants	$(d/dx)(c)=0$	3	0
powers	$(d/dx)x^n = nx^{n-1}$	x^2	2x
addition (sum rule)	$(d/dx)(f(x)+g(x)) = f'(x) + g'(x)$	$x^2 + 3$	2x
subtraction (difference rule)	$(d/dx)(f(x)-g(x)) = f'(x) - g'(x)$	$3-x^2$	-2x
multiplication (product rule)	$(d/dx)(f(x)g(x))= f'(x)g(x) + f(x)g'(x)$	$(x^2 + 3)(x^2 - 3)$	$2x(x^2 - 3) + 2x(x^2 + 3)$
division (quotient rule)	$(d/dx)(f(x)/g(x)) = (f'(x)g(x) - f(x)g'(x))/(g(x)g'(x))$	$3/x^2$	$-3*2x/x^3*x^3 = -6/x^3$
composition (chain rule)	$(d/dx)(f(g(x))) = g'(x)f'(g(x))$	$(x^2+3)^2$	$2x*2(x^2+3) = 4x(x^2+3)$

(Note, due to limitations of html, the notation of derivative in the table is "(d/dx)", or f'(x), which means the derivative as usual. Note that the power rule works for all powers, not just whole numbers.)

In class I will give examples of application of these rules.