2.1 Lecture Notes
Math 206
02/04/08
Mammenga

DEFINING THE DERIVATIVE

A. Definition: Given two points P and Q on a curve, the line that passes through P and Q is called a *secant line*. What if P and Q are very close together?

B. Definition: Let f be a function defined near and at $x = a$. The *derivative of f at $x = a$*, denoted by $f'(a)$, is defined by the limit equation

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}.$$

C. How does the formal definition of the derivative match up with our previous interpretation? That is, does the formal definition of $f'(a)$ give the slope of the tangent line at $x = a$?

TEAM ACTIVITIES:

1. Let's practice computing the derivative using its formal definition.
   (a) Find $f'(x)$ for $f(x) = 2x + 1$.
   (b) Find $f'(x)$ for $f(x) = x^2 - 3x$.
   (c) Find $f'(x)$ for $f(x) = \frac{1}{x}$.

2. Compute $g'(-4)$ if $g(x) = x^2 + 5$. Check this on Derive by graphing $g(x)$ and estimating the slope at $x = -4$.

3. Compute $h'(1)$ if $h(x) = \sqrt{2x+1}$.

ASSIGNMENT:

1. Let $f(x) = 3 - 2x^2$. Compute $f'(x)$ using the formal definition of the derivative. You must show your work for full credit.

2. Let $g(x) = \frac{1}{4x-1}$. Compute $g'(x)$ using the formal definition of the derivative. You must show your work for full credit.

3. Let $f(x) = \frac{x+1}{x-1}$. Compute $f'(5)$ using the formal definition of the derivative. You must show your work for full credit.