Practice Probs <u>Friday</u>: 9/5 1C-2, 1C-3, 1C-4, 1D-3, 1D-5 18.01, September 8, 2003

Practice Probs <u>Tuesday</u> 9/9 1E-1, 1E-3, 1E-5 Handed out PS#1, due Tuesday 9/16 in Rm 2-106, <u>before lecture</u>.

1. Explained difference between derivative of f at a point x_0 ($def = \lim_{\Delta x \to 0} \frac{f(x_0+\Delta x)-f(x_0)}{\Delta x}$) and derivative function $f'(x)$ (=expression/function whose value at x_0 is derive. Of f at x_0)

Why?!? Don't want to see things like $\frac{d}{dx}(x^n) = \lim_{\Delta x \to 0} \frac{f(x_0+\Delta x)-f(x_0)}{\Delta x}$) as a <u>function</u>. (limits of function not covered in calculus).

2. <u>Eq'n of tangent line</u>. $y = f'(x_g)(x - x_g) + y_0$

3. Rules for computing derivative: $\frac{d}{dx}(c) = 0$, $\frac{d}{dx}(c\upsilon) = c\frac{d\upsilon}{dx}$, $\frac{d}{dx}(\upsilon + v) = \frac{d\upsilon}{dx} + \frac{dv}{dx}$

A. $\underline{\frac{d}{dx}(x^n) = nx^{n-1}}$ - spent some time showing how this follows from B.T.

B. <u>Product rule/Leibnitz rule</u> : $\frac{d}{dx}(\upsilon v) = \frac{d\upsilon}{dx}v + \upsilon\frac{dv}{dx}$

Derived this from definition of derivative. Used this to give a second proof of $\frac{d}{dx}(x^n) = nx^{n-1}$ by induction (quite quickly).

C. <u>Quotient rule</u> : $\frac{d}{dx}(\frac{\upsilon}{v}) = \frac{\frac{d\upsilon}{dx}v - \upsilon\frac{dv}{dx}}{v^2}$

Derived from product rule: Introduce $w = \frac{\upsilon}{v}$. Then $\upsilon = vw$. So $\frac{d\upsilon}{dx}(P.R.) = \frac{dv}{dx}w + v\frac{dw}{dx}$.
Solve for $\frac{dw}{dx} = \frac{1}{v}[\frac{d\upsilon}{dx} - w\frac{dv}{dx}] = \frac{1}{v^2}[v\frac{d\upsilon}{dx} - \upsilon\frac{dv}{dx}]$.

D. $\underline{\frac{d}{dx}(\upsilon^n) = n\upsilon^{n-1}\frac{d\upsilon}{dx}}$. Only indicated proof. Will do next time by the chain rule.