Important Derivatives — 02/23/05

This list is meant to cover all the derivatives you are expected to know by now. Most of these results can be recreated using very basic tools (and we've done this in class!).

1. Basic Rules

(1) Sums: $\dfrac{d}{dx}[f(x) + g(x)] = \dfrac{d}{dx}[f(x)] + \dfrac{d}{dx}[g(x)]$

(2) Scalar Multiples: $\dfrac{d}{dx}[cf(x)] = c\dfrac{d}{dx}[f(x)]$

(3) Power rule: $\dfrac{d}{dx}[x^n] = nx^{n-1}$

(4) Product rule: $\dfrac{d}{dx}[f(x) \cdot g(x)] = f(x)\dfrac{d}{dx}[g(x)] + g(x)\dfrac{d}{dx}[f(x)]$

(5) Quotient rule: $\dfrac{d}{dx}\left[\dfrac{f(x)}{g(x)}\right] = \dfrac{g(x)\dfrac{d}{dx}[f(x)] - f(x)\dfrac{d}{dx}[g(x)]}{(g(x))^2}$

(6) Chain rule: $\dfrac{d}{dx}[f(g(x)] = f'(g(x)) \cdot g'(x)$

2. Some important functions

(1) $\dfrac{d}{dx}[a^x] = \log(a)a^x$

(2) $\dfrac{d}{dx}[\log_a(x)] = \dfrac{1}{\log(a)x}$

(3) $\dfrac{d}{dx}[\sin(x)] = \cos(x)$

(4) $\dfrac{d}{dx}[\cos(x)] = -\sin(x)$

(5) $\dfrac{d}{dx}[\tan(x)] = \sec^2(x)$

(6) $\dfrac{d}{dx}[\sec(x)] = \sec(x)\tan(x)$

(7) $\dfrac{d}{dx}[\arcsin(x)] = \dfrac{1}{\sqrt{1 - x^2}}$

(8) $\dfrac{d}{dx}[\arctan(x)] = \dfrac{1}{1 + x^2}$