Math 106-350/550 - Analytic Geometry & Calculus I **1st Semester, '06-'07**
Summary of Differentiation Rules for the Gateway Exam

General Rules

k is a constant, u, v and f, g are functions of x.

(1) If k is a constant, then $\dfrac{d}{dx}k = 0$.

(2) If n is a real number, then $\dfrac{dx^n}{dx} = nx^{n-1}$.

(3) $\dfrac{d(ku)}{dx} = k\dfrac{du}{dx}$.

(4) $\dfrac{d(u+v)}{dx} = \dfrac{du}{dx} + \dfrac{dv}{dx}$.

(5) (Product rule) $\dfrac{d(u \cdot v)}{dx} = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$.

(6) (Quotient rule) $\dfrac{d}{dx}\left(\dfrac{u}{v}\right) = \dfrac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$.

(7) (Chain rule) $\dfrac{d}{dx}f(g(x)) = f'(g(x)) \cdot g'(x)$.

Specific Functions

- For a constant, $\dfrac{da^x}{dx} = \ln a \cdot a^x$. In particular $\dfrac{de^x}{dx} = e^x$.
- $\dfrac{d}{dx}\sin x = \cos x, \qquad \dfrac{d}{dx}\cos x = -\sin x, \qquad \dfrac{d}{dx}\tan x = \sec^2 x.$
- $\dfrac{d}{dx}\ln x = \dfrac{1}{x}$.
- $\dfrac{d}{dx}\arcsin x = \dfrac{1}{\sqrt{1-x^2}}, \qquad \dfrac{d}{dx}\arctan x = \dfrac{1}{1+x^2}.$