Derivatives List - November 13, 2012 *www.askmath.weebly.com*

Constant: $\frac{d}{dx}[n] = 0$

Power rule: $\frac{d}{dx}[x^n] = n \cdot x^{n-1}$

Constant Multiple rule: $\frac{d}{dx}[c \cdot f(x)] = c \cdot f'(x)$, where c is a constant

Sum/difference rule: $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$

Product rule: $\frac{d}{dx}[u \cdot v] = u \cdot v' + v \cdot u'$

Quotient rule: $\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{v \cdot u' - u \cdot v'}{v^2}$

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

$\frac{d}{dx}[\sin(u)] = \cos(u) \cdot u'$

$\frac{d}{dx}[\cos(u)] = -\sin(u) \cdot u'$

$\frac{d}{dx}[\tan(u)] = \sec^2(u) \cdot u'$

$\frac{d}{dx}[\csc(u)] = -\csc u \cdot \cot u \cdot u'$

$\frac{d}{dx}[\sec(u)] = \sec u \cdot \tan u \cdot u'$

$\frac{d}{dx}[\cot(u)] = -\csc^2 u \cdot u'$

$\frac{d}{dx}[\sin^{-1}(u)] = \frac{u'}{\sqrt{1-u^2}}$

$\frac{d}{dx}[\sec^{-1}(u)] = \frac{u'}{|u|\sqrt{u^2-1}}$

$\frac{d}{dx}[\tan^{-1}(u)] = \frac{u'}{1+u^2}$

$\frac{d}{dx}[e^u] = e^u \cdot u'$

$\frac{d}{dx}[a^u] = a^u \cdot \ln u \cdot u'$

$\frac{d}{dx}[x^x]$:

$$\begin{aligned} y &= x^x \\ \ln y &= x \ln x \\ \frac{d}{dx}[\ln y] &= \frac{d}{dx}[x \ln x] \\ \frac{y'}{y} &= x \cdot \frac{1}{x} + \ln x \\ y' &= x^x(1 + \ln x) \end{aligned}$$

$\frac{d}{dx}\left[\ln u\right] = \frac{u'}{u}$