Derivative Formulas

Here are some formulas to calculate derivatives. Suppose that f, g, and u are differentiable functions, c is a real number, and a is a positive real number. Note that $\frac{d}{dx}[u] = \frac{du}{dx}$. In (5), assume that g is non-zero.

1. $\frac{d}{dx}[c] = 0$
2. $\frac{d}{dx}[cf] = c\frac{df}{dx}$
3. $\frac{d}{dx}[f \pm g] = \frac{df}{dx} \pm \frac{dg}{dx}$
4. $\frac{d}{dx}[f \cdot g] = g\frac{df}{dx} + f\frac{dg}{dx}$
5. $\frac{d}{dx}\left[\frac{f}{g}\right] = \frac{g\frac{df}{dx} - f\frac{dg}{dx}}{(g)^2}$
6. $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$
7. $\frac{d}{dx}[u^n] = nu^{n-1} \cdot \frac{du}{dx}$
8. $\frac{d}{dx}[a^u] = a^u \ln(a) \cdot \frac{du}{dx}$
9. $\frac{d}{dx}[e^u] = e^u \cdot \frac{du}{dx}$
10. $\frac{d}{dx}[\ln(u)] = \frac{1}{u} \cdot \frac{du}{dx}$
11. $\frac{d}{dx}[\sin(u)] = \cos(u) \cdot \frac{du}{dx}$
12. $\frac{d}{dx}[\cos(u)] = -\sin(u) \cdot \frac{du}{dx}$
13. $\frac{d}{dx}[\tan(u)] = \sec^2(u) \cdot \frac{du}{dx}$

Tip: To find the derivative of secant, cosecant, and cotangent, write them in terms of sine and cosine and use one of the above to differentiate.