Differentiation formulas

1. $\frac{d}{dx}(cu) = c\frac{du}{dx}$
2. $\frac{d}{dx}(u+v-w) = \frac{du}{dx}+\frac{dv}{dx}-\frac{dw}{dx}$
3. $\frac{d}{dx}(uv) = u\frac{dv}{dx}+v\frac{du}{dx}$
4. $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx}-u\frac{dv}{dx}}{v^2}$
5. $\frac{d}{dx}[f(u)] = \frac{d}{du}[f(u)]\frac{du}{dx}$
6. $\frac{d}{dx}(u^n) = nu^{n-1}\frac{du}{dx}$
7. $\frac{d}{dx}(\ln u) = \frac{1}{u}\frac{du}{dx}$
8. $\frac{d}{dx}(\log_a u) = \frac{1}{u \ln a}\frac{du}{dx}$
9. $\frac{d}{dx}(e^u) = e^u\frac{du}{dx}$
10. $\frac{d}{dx}(a^u) = a^u \ln a\frac{du}{dx}$
11. $\frac{d}{dx}(u^v) = u^v \ln u\frac{dv}{dx}+vu^{v-1}\frac{du}{dx}$
12. $\frac{d}{dx}\int_a^x f(t)dt = f(x)$
13. $\frac{d}{dx}(\sin u) = \cos u\frac{du}{dx}$
14. $\frac{d}{dx}(\cos u) = -\sin u\frac{du}{dx}$
15. $\frac{d}{dx}(\tan u) = \sec^2 u\frac{du}{dx}$
16. $\frac{d}{dx}(\cot u) = -\csc^2 u\frac{du}{dx}$
17. $\frac{d}{dx}(\sec u) = \sec u \tan u\frac{du}{dx}$
18. $\frac{d}{dx}(\csc u) = -\csc u \cot u\frac{du}{dx}$
19. $\frac{d}{dx}(\sin^{-1} u) = \frac{1}{\sqrt{1-u^2}}\frac{du}{dx}, \left(-\frac{\pi}{2} \le \sin^{-1} u \le \frac{\pi}{2}\right)$
20. $\frac{d}{dx}(\cos^{-1} u) = -\frac{1}{\sqrt{1-u^2}}\frac{du}{dx}, (0 \le \cos^{-1} u \le \pi)$
21. $\frac{d}{dx}(\tan^{-1} u) = \frac{1}{1+u^2}\frac{du}{dx}, \left(-\frac{\pi}{2} < \tan^{-1} u < \frac{\pi}{2}\right)$
22. $\frac{d}{dx}(\cot^{-1} u) = -\frac{1}{1+u^2}\frac{du}{dx}, (0 \le \cot^{-1} u \le \pi)$
23. $\frac{d}{dx}(\sec^{-1} u) = \frac{1}{u\sqrt{u^2-1}}\frac{du}{dx}, \left(0 \le \sec^{-1} u < \frac{\pi}{2}, -\pi \le \sec^{-1} u < -\frac{\pi}{2}\right)$
24. $\frac{d}{dx}(\csc^{-1} u) = -\frac{1}{u\sqrt{u^2-1}}\frac{du}{dx}, \left(0 < \csc^{-1} u \le \frac{\pi}{2}, -\pi < \csc^{-1} u \le -\frac{\pi}{2}\right)$