Differential Rules

General Formulas

1. $\frac{d}{dx}(c) = 0$	2. $\frac{d}{dx}[cf(x)] = cf'(x)$
3. $\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x)$	4. $\frac{d}{dx}[f(x) - g(x)] = f'(x) - g(x)$
5. $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$ (Product Rule)	6. $\frac{d}{dx}[\frac{f(x)}{g(x)}] = \frac{f(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$ (Quotient Rule)
7. $\frac{d}{dx}f(g(x)) = f'(g(x))g'(x)$ (Chain Rule)	8. $\frac{d}{dx}(x^n) = nx^{n-1}$ (Power Rule)

Exponential and Logarithmic Functions

9. $\frac{d}{dx}(e^x) = e^x$	10. $\frac{d}{dx}(a^x) = a^x \ln a$
11. $\frac{d}{dx}\ln\|x\| = \frac{1}{x}$	12. $\frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}$

Trigonometric Functions

13. $\frac{d}{dx}(\sin x) = \cos x$	14. $\frac{d}{dx}(\cos x) = -\sin x$	15. $\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$
16. $\frac{d}{dx}(\csc x) = -\csc x \cot x$	17. $\frac{d}{dx}(\sec x) = \sec x \tan x$	18. $\frac{d}{dx}(\cot x) = -\csc^2 x$

Inverse Trigonomic Functions

19. $\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$	20. $\frac{d}{dx}(\cos^{-1} x) = -\frac{1}{\sqrt{1-x^2}}$	21. $\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$
22. $\frac{d}{dx}(\csc^{-1} x) = -\frac{1}{x\sqrt{x^2-1}}$	23. $\frac{d}{dx}(\sec^{-1} x) = \frac{1}{x\sqrt{x^2-1}}$	24. $\frac{d}{dx}(\cot^{-1} x) = -\frac{1}{1+x^2}$

Hyperbolic Functions

25. $\frac{d}{dx}(\sinh x) = \cosh x$	26. $\frac{d}{dx}(\cosh x) = \sinh x$	27. $\frac{d}{dx}(\tanh x) = \operatorname{sech}^2 x$
28. $\frac{d}{dx}(\operatorname{csch} x) = -\operatorname{csch} x \coth x$	29. $\frac{d}{dx}(\operatorname{sech} x) = -\operatorname{sech} c \tanh x$	30. $\frac{d}{dx}(\coth c) = -\operatorname{csch}^2 x$

Inverse Hyperbolic Functions

31. $\frac{d}{dx}(\sinh^{-1} x) = \frac{1}{\sqrt{1+x^2}}$	32. $\frac{d}{dx}(\cosh^{-1} x) = \frac{1}{\sqrt{x^2-1}}$	33. $\frac{d}{dx}(\tanh^{-1} x) = \frac{1}{1-x^2}$
34. $\frac{d}{dx}(\operatorname{csch}^{-1} x) = -\frac{1}{\|x\|\sqrt{x^2+1}}$	35. $\frac{d}{dx}(\operatorname{sech}^{-1} x) = -\frac{1}{x\sqrt{1-x^2}}$	36. $\frac{d}{dx}(\coth^{-1} x) = \frac{1}{1-x^2}$