

Differential Rules

General Formulas

1. $\frac{d}{dx}(c) = 0$, where c is a constant	2. $\frac{d}{dx}[cf(x)] = c f'(x)$
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. $\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$	6. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$
7. $\frac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$	8. $\frac{d}{dx}(x^n) = nx^{n-1}$

Exponential and Logarithmic Functions

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

Trigonometric Functions

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

Inverse Trigonometric 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. $\frac{d}{dx}[\operatorname{sech}(x)] = -\operatorname{sech}(x) \tanh(x)$	30. $\frac{d}{dx}[\coth(x)] = -\operatorname{csch}^2(x)$

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. $\frac{d}{dx}[\coth^{-1}(x)] = \frac{1}{1-x^2}$