

## REVIEW OF DIFFERENTIATION

**Rules**

1. **Constant:**  $\frac{d}{dx}c = 0$

2. **Constant Multiple:**  $\frac{d}{dx}cf(x) = cf'(x)$

3. **Sum:**  $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$

4. **Product:**  $\frac{d}{dx}f(x)g(x) = f(x)g'(x) + g(x)f'(x)$

5. **Quotient:**  $\frac{d}{dx}\frac{f(x)}{g(x)} = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$

6. **Chain:**  $\frac{d}{dx}f(g(x)) = f'(g(x))g'(x)$

7. **Power:**  $\frac{d}{dx}x^n = nx^{n-1}$

8. **Power:**  $\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1}g'(x)$

**Functions****Trigonometric:**

9.  $\frac{d}{dx}\sin x = \cos x$

10.  $\frac{d}{dx}\cos x = -\sin x$

11.  $\frac{d}{dx}\tan x = \sec^2 x$

12.  $\frac{d}{dx}\cot x = -\csc^2 x$

13.  $\frac{d}{dx}\sec x = \sec x \tan x$

14.  $\frac{d}{dx}\csc x = -\csc x \cot x$

**Inverse trigonometric:**

15.  $\frac{d}{dx}\sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$

16.  $\frac{d}{dx}\cos^{-1} x = -\frac{1}{\sqrt{1-x^2}}$

17.  $\frac{d}{dx}\tan^{-1} x = \frac{1}{1+x^2}$

18.  $\frac{d}{dx}\cot^{-1} x = -\frac{1}{1+x^2}$

19.  $\frac{d}{dx}\sec^{-1} x = \frac{1}{|x|\sqrt{x^2-1}}$

20.  $\frac{d}{dx}\csc^{-1} x = -\frac{1}{|x|\sqrt{x^2-1}}$

**Hyperbolic:**

21.  $\frac{d}{dx}\sinh x = \cosh x$

22.  $\frac{d}{dx}\cosh x = \sinh x$

23.  $\frac{d}{dx}\tanh x = \operatorname{sech}^2 x$

24.  $\frac{d}{dx}\coth x = -\operatorname{csch}^2 x$

25.  $\frac{d}{dx}\operatorname{sech} x = -\operatorname{sech} x \tanh x$

26.  $\frac{d}{dx}\operatorname{csch} x = -\operatorname{csch} x \coth x$

**Inverse hyperbolic:**

27.  $\frac{d}{dx}\sinh^{-1} x = \frac{1}{\sqrt{x^2+1}}$

28.  $\frac{d}{dx}\cosh^{-1} x = \frac{1}{\sqrt{x^2-1}}$

29.  $\frac{d}{dx}\tanh^{-1} x = \frac{1}{1-x^2}$

30.  $\frac{d}{dx}\coth^{-1} x = \frac{1}{1-x^2}$

31.  $\frac{d}{dx}\operatorname{sech}^{-1} x = -\frac{1}{x\sqrt{1-x^2}}$

32.  $\frac{d}{dx}\operatorname{csch}^{-1} x = -\frac{1}{|x|\sqrt{x^2+1}}$

**Exponential:**

33.  $\frac{d}{dx}e^x = e^x$

34.  $\frac{d}{dx}a^x = a^x(\ln a)$

**Logarithmic:**

35.  $\frac{d}{dx}\ln|x| = \frac{1}{x}$

36.  $\frac{d}{dx}\log_a x = \frac{1}{x(\ln a)}$

## BRIEF TABLE OF INTEGRALS

1. $\int u^n du = \frac{u^{n+1}}{n+1} + C, n \neq -1$	2. $\int \frac{1}{u} du = \ln u  + C$
3. $\int e^u du = e^u + C$	4. $\int a^u du = \frac{1}{\ln a} a^u + C$
5. $\int \sin u du = -\cos u + C$	6. $\int \cos u du = \sin u + C$
7. $\int \sec^2 u du = \tan u + C$	8. $\int \csc^2 u du = -\cot u + C$
9. $\int \sec u \tan u du = \sec u + C$	10. $\int \csc u \cot u du = -\csc u + C$
11. $\int \tan u du = -\ln \cos u  + C$	12. $\int \cot u du = \ln \sin u  + C$
13. $\int \sec u du = \ln \sec u + \tan u  + C$	14. $\int \csc u du = \ln \csc u - \cot u  + C$
15. $\int u \sin u du = \sin u - u \cos u + C$	16. $\int u \cos u du = \cos u + u \sin u + C$
17. $\int \sin^2 u du = \frac{1}{2}u - \frac{1}{4}\sin 2u + C$	18. $\int \cos^2 u du = \frac{1}{2}u + \frac{1}{4}\sin 2u + C$
19. $\int \tan^2 u du = \tan u - u + C$	20. $\int \cot^2 u du = -\cot u - u + C$

Activate Windows  
Go to Settings to activate Windows.

21. $\int \sin^3 u du = -\frac{1}{3}(2 + \sin^2 u)\cos u + C$	22. $\int \cos^3 u du = \frac{1}{3}(2 + \cos^2 u)\sin u + C$
23. $\int \tan^3 u du = \frac{1}{2}\tan^2 u + \ln \cos u  + C$	24. $\int \cot^3 u du = -\frac{1}{2}\cot^2 u - \ln \sin u  + C$
25. $\int \sec^3 u du = \frac{1}{2}\sec u \tan u + \frac{1}{2}\ln \sec u + \tan u  + C$	26. $\int \csc^3 u du = -\frac{1}{2}\csc u \cot u + \frac{1}{2}\ln \csc u - \cot u  + C$
27. $\int \sin au \cos bu du = \frac{\sin(a-b)u}{2(a-b)} - \frac{\sin(a+b)u}{2(a+b)} + C$	28. $\int \cos au \cos bu du = \frac{\sin(a-b)u}{2(a-b)} + \frac{\sin(a+b)u}{2(a+b)} + C$
29. $\int e^{au} \sin bu du = \frac{e^{au}}{a^2 + b^2}(a \sin bu - b \cos bu) + C$	30. $\int e^{au} \cos bu du = \frac{e^{au}}{a^2 + b^2}(a \cos bu + b \sin bu) + C$
31. $\int \sinh u du = \cosh u + C$	32. $\int \cosh u du = \sinh u + C$
33. $\int \operatorname{sech}^2 u du = \tanh u + C$	34. $\int \operatorname{csch}^2 u du = -\operatorname{coth} u + C$
35. $\int \tanh u du = \ln(\cosh u) + C$	36. $\int \operatorname{coth} u du = \ln \sinh u  + C$
37. $\int \ln u du = u \ln u - u + C$	38. $\int u \ln u du = \frac{1}{2}u^2 \ln u - \frac{1}{4}u^2 + C$
39. $\int \frac{1}{\sqrt{a^2 - u^2}} du = \sin^{-1} \frac{u}{a} + C$	40. $\int \frac{1}{\sqrt{a^2 + u^2}} du = \ln u + \sqrt{a^2 + u^2}  + C$

Activate Windows  
Go to Settings to activate Windows.

41. $\int \sqrt{a^2 - u^2} du = \frac{u}{2}\sqrt{a^2 - u^2} + \frac{a^2}{2}\sin^{-1} \frac{u}{a} + C$	42. $\int \sqrt{a^2 + u^2} du = \frac{u}{2}\sqrt{a^2 + u^2} + \frac{a^2}{2}\ln u + \sqrt{a^2 + u^2}  + C$
43. $\int \frac{1}{a^2 + u^2} du = \frac{1}{a}\tan^{-1} \frac{u}{a} + C$	44. $\int \frac{1}{a^2 - u^2} du = \frac{1}{2a}\ln\left \frac{a+u}{a-u}\right  + C$