

Derivative and Integral Formulas

Derivative Formulas u and v are functions of x ; c_1 and c_2 are constants.

1. $\frac{d}{dx}(c_1u + c_2v) = c_1u' + c_2v'$ (Sum Rule)

2. $\frac{d}{dx}uv = uv' + vu'$ (Product Rule)

3. $\frac{d}{dx}\frac{u}{v} = \frac{vu' - uv'}{v^2}$ (Quotient Rule)

4. $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$ (Chain Rule)

5. $\frac{d}{dx}u^n = nu^{n-1} \frac{du}{dx}$ (Power Rule)

6. $\frac{d}{dx}\ln u = \frac{1}{u} \frac{du}{dx}$

7. $\frac{d}{dx}e^u = e^u \frac{du}{dx}$

8. $\frac{d}{dx}b^u = b^u \ln b \frac{du}{dx}$

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

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

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

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

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

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

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

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

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

18. $\frac{d}{dx}\sec^{-1}u = \frac{1}{|u|\sqrt{u^2-1}} \frac{du}{dx}$

19. $\frac{d}{dx}\sinh u = \cosh u \frac{du}{dx}$

20. $\frac{d}{dx}\cosh u = \sinh u \frac{du}{dx}$

21. $\frac{d}{dx}\sinh^{-1}u = \frac{1}{\sqrt{u^2+1}} \frac{du}{dx}$

22. $\frac{d}{dx}\cosh^{-1}u = \frac{1}{\sqrt{u^2-1}} \frac{du}{dx}$

23. $\frac{d}{dx}\tanh^{-1}u = \frac{1}{1-u^2} \frac{du}{dx}, |u| < 1$

24. $\frac{d}{dx}\coth^{-1}u = \frac{1}{1-u^2} \frac{du}{dx}, |u| > 1$

Integral Formulas u and v are functions of x ; c_1, c_2, C , and a are constants.

1. $\int (c_1 u + c_2 v) dx = c_1 \int u dx + c_2 \int v dx$
2. $\int u dv = uv - \int v du$ (integration by parts)
3. $\int u^n du = \frac{u^{n+1}}{n+1} + C, n \neq -1$
4. $\int \frac{1}{u} du = \ln |u| + C$
5. $\int b^u du = \frac{b^u}{\ln b} + C$
6. $\int e^u du = e^u + C$
7. $\int \cos u du = \sin u + C$
8. $\int \sin u du = -\cos u + C$
9. $\int \sec^2 u du = \tan u + C$
10. $\int \csc^2 u du = -\cot u + C$
11. $\int \sec u \tan u du = \sec u + C$
12. $\int \csc u \cot u du = -\csc u + C$
13. $\int \frac{1}{\sqrt{a^2 - u^2}} du = \sin^{-1} \frac{u}{a} + C$
14. $\int \frac{1}{a^2 + u^2} du = \frac{1}{a} \tan^{-1} \frac{u}{a} + C$
15. $\int \cosh u du = \sinh u + C$
16. $\int \sinh u du = \cosh u + C$
17. $\int \frac{1}{\sqrt{u^2 + a^2}} du = \begin{cases} \sinh^{-1} \frac{u}{a} + C \\ \ln (u + \sqrt{u^2 + a^2}) + C \end{cases}$
18. $\int \frac{1}{\sqrt{u^2 - a^2}} du = \begin{cases} \cosh^{-1} \frac{u}{a} + C \\ \ln (u + \sqrt{u^2 - a^2}) + C \end{cases}$
19. $\int \frac{1}{a^2 - u^2} du = \begin{cases} \frac{1}{a} \tanh^{-1} \frac{u}{a} + C, |u| < a \\ \frac{1}{a} \coth^{-1} \frac{u}{a} + C, |u| > a \end{cases}$
20. $\int \frac{1}{a^2 - u^2} du = \frac{1}{2a} \ln \left| \frac{a+u}{a-u} \right| + C$
21. $\int \tan u du = -\ln |\cos u| + C$

$$22. \int \cot u \, du = \ln |\sin u| + C$$

$$23. \int \sec u \, du = \ln |\sec u + \tan u| + C$$

$$24. \int \csc u \, du = \ln |\csc u - \cot u| + C$$