

DERIVATIVES AND INDEFINITE INTEGRALS

In these formulas, u , v , and w represent functions of x . Also, a , c , and n represent constants. All arguments of the trigonometric functions are in radians. A constant of integration should be added to the integrals. To avoid terminology difficulty, the following definitions are followed: $\arcsin u = \sin^{-1} u$, $(\sin u)^{-1} = 1/\sin u$.

1. $dc/dx = 0$
2. $dx/dx = 1$
3. $d(cu)/dx = c du/dx$
4. $d(u + v - w)/dx = du/dx + dv/dx - dw/dx$
5. $d(uv)/dx = u dv/dx + v du/dx$
6. $d(uvw)/dx = uv dw/dx + uw dv/dx + vw du/dx$
7. $\frac{d(u/v)}{dx} = \frac{v du/dx - u dv/dx}{v^2}$
8. $d(u^n)/dx = nu^{n-1} du/dx$
9. $d[f(u)]/dx = \{d[f(u)]/du\} du/dx$
10. $du/dx = 1/(dx/du)$
11. $\frac{d(\log_a u)}{dx} = (\log_a e) \frac{1}{u} \frac{du}{dx}$
12. $\frac{d(\ln u)}{dx} = \frac{1}{u} \frac{du}{dx}$
13. $\frac{d(a^u)}{dx} = (\ln a) a^u \frac{du}{dx}$
14. $d(e^u)/dx = e^u du/dx$
15. $d(u^v)/dx = vu^{v-1} du/dx + (\ln u) u^v dv/dx$
16. $d(\sin u)/dx = \cos u du/dx$
17. $d(\cos u)/dx = -\sin u du/dx$
18. $d(\tan u)/dx = \sec^2 u du/dx$
19. $d(\cot u)/dx = -\csc^2 u du/dx$
20. $d(\sec u)/dx = \sec u \tan u du/dx$
21. $d(\csc u)/dx = -\csc u \cot u du/dx$
22. $\frac{d(\sin^{-1} u)}{dx} = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx} \quad (-\pi/2 \leq \sin^{-1} u \leq \pi/2)$
23. $\frac{d(\cos^{-1} u)}{dx} = -\frac{1}{\sqrt{1-u^2}} \frac{du}{dx} \quad (0 \leq \cos^{-1} u \leq \pi)$
24. $\frac{d(\tan^{-1} u)}{dx} = \frac{1}{1+u^2} \frac{du}{dx} \quad (-\pi/2 < \tan^{-1} u < \pi/2)$
25. $\frac{d(\cot^{-1} u)}{dx} = -\frac{1}{1+u^2} \frac{du}{dx} \quad (0 < \cot^{-1} u < \pi)$
26. $\frac{d(\sec^{-1} u)}{dx} = \frac{1}{u\sqrt{u^2-1}} \frac{du}{dx} \quad (0 < \sec^{-1} u < \pi/2)(-\pi \leq \sec^{-1} u < -\pi/2)$
27. $\frac{d(\csc^{-1} u)}{dx} = -\frac{1}{u\sqrt{u^2-1}} \frac{du}{dx} \quad (0 < \csc^{-1} u \leq \pi/2)(-\pi < \csc^{-1} u \leq -\pi/2)$
1. $\int df(x) = f(x)$
2. $\int dx = x$
3. $\int a f(x) dx = a \int f(x) dx$
4. $\int [u(x) \pm v(x)] dx = \int u(x) dx \pm \int v(x) dx$
5. $\int x^m dx = \frac{x^{m+1}}{m+1} \quad (m \neq -1)$
6. $\int u(x) dv(x) = u(x)v(x) - \int v(x) du(x)$
7. $\int \frac{dx}{ax+b} = \frac{1}{a} \ln|ax+b|$
8. $\int \frac{dx}{\sqrt{x}} = 2\sqrt{x}$
9. $\int a^x dx = \frac{a^x}{\ln a}$
10. $\int \sin x dx = -\cos x$
11. $\int \cos x dx = \sin x$
12. $\int \sin^2 x dx = \frac{x}{2} - \frac{\sin 2x}{4}$
13. $\int \cos^2 x dx = \frac{x}{2} + \frac{\sin 2x}{4}$
14. $\int x \sin x dx = \sin x - x \cos x$
15. $\int x \cos x dx = \cos x + x \sin x$
16. $\int \sin x \cos x dx = (\sin^2 x)/2$
17. $\int \sin ax \cos bx dx = -\frac{\cos(a-b)x}{2(a-b)} - \frac{\cos(a+b)x}{2(a+b)} \quad (a^2 \neq b^2)$
18. $\int \tan x dx = -\ln|\cos x| = \ln|\sec x|$
19. $\int \cot x dx = -\ln|\csc x| = \ln|\sin x|$
20. $\int \tan^2 x dx = \tan x - x$
21. $\int \cot^2 x dx = -\cot x - x$
22. $\int e^{ax} dx = (1/a) e^{ax}$
23. $\int x e^{ax} dx = (e^{ax}/a^2)(ax-1)$
24. $\int \ln x dx = x[\ln(x)-1] \quad (x > 0)$
25. $\int \frac{dx}{a^2+x^2} = \frac{1}{a} \tan^{-1} \frac{x}{a} \quad (a \neq 0)$
26. $\int \frac{dx}{ax^2+c} = \frac{1}{\sqrt{ac}} \tan^{-1} \left(x \sqrt{\frac{a}{c}} \right), \quad (a > 0, c > 0)$
- 27a. $\int \frac{dx}{ax^2+bx+c} = \frac{2}{\sqrt{4ac-b^2}} \tan^{-1} \frac{2ax+b}{\sqrt{4ac-b^2}} \quad (4ac-b^2 > 0)$
- 27b. $\int \frac{dx}{ax^2+bx+c} = \frac{1}{\sqrt{b^2-4ac}} \ln \left| \frac{2ax+b-\sqrt{b^2-4ac}}{2ax+b+\sqrt{b^2-4ac}} \right| \quad (b^2-4ac > 0)$
- 27c. $\int \frac{dx}{ax^2+bx+c} = -\frac{2}{2ax+b}, \quad (b^2-4ac = 0)$