

Differentiation Rules

1. $\frac{d}{dx}(cx) = c$
2. $\frac{d}{dx}(u \pm v) = u' \pm v'$
3. $\frac{d}{dx}(u \cdot v) = uv' + u'v$
4. $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{vu' - uv'}{v^2}$
5. $\frac{d}{dx}(u(v)) = u'(v)v'$
6. $\frac{d}{dx}(c) = 0$
7. $\frac{d}{dx}(x) = 1$
8. $\frac{d}{dx}(x^n) = nx^{n-1}$
9. $\frac{d}{dx}(e^x) = e^x$
10. $\frac{d}{dx}(a^x) = \ln a \cdot a^x$
11. $\frac{d}{dx}(\ln x) = \frac{1}{x}$
12. $\frac{d}{dx}(\log_a x) = \frac{1}{\ln a} \cdot \frac{1}{x}$
13. $\frac{d}{dx}(\sin x) = \cos x$
14. $\frac{d}{dx}(\cos x) = -\sin x$
15. $\frac{d}{dx}(\csc x) = -\csc x \cot x$
16. $\frac{d}{dx}(\sec x) = \sec x \tan x$
17. $\frac{d}{dx}(\tan x) = \sec^2 x$
18. $\frac{d}{dx}(\cot x) = -\csc^2 x$
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. $\frac{d}{dx}(\csc^{-1} x) = \frac{-1}{|x|\sqrt{x^2-1}}$
22. $\frac{d}{dx}(\sec^{-1} x) = \frac{1}{|x|\sqrt{x^2-1}}$
23. $\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$
24. $\frac{d}{dx}(\cot^{-1} x) = \frac{-1}{1+x^2}$
25. $\frac{d}{dx}(\cosh x) = \sinh x$
26. $\frac{d}{dx}(\sinh x) = \cosh x$
27. $\frac{d}{dx}(\tanh x) = \operatorname{sech}^2 x$
28. $\frac{d}{dx}(\operatorname{sech} x) = -\operatorname{sech} x \tanh x$
29. $\frac{d}{dx}(\operatorname{csch} x) = -\operatorname{csch} x \coth x$
30. $\frac{d}{dx}(\coth x) = -\operatorname{csch}^2 x$
31. $\frac{d}{dx}(\cosh^{-1} x) = \frac{1}{\sqrt{x^2-1}}$
32. $\frac{d}{dx}(\sinh^{-1} x) = \frac{1}{\sqrt{x^2+1}}$
33. $\frac{d}{dx}(\operatorname{sech}^{-1} x) = \frac{-1}{x\sqrt{1-x^2}}$
34. $\frac{d}{dx}(\operatorname{csch}^{-1} x) = \frac{-1}{|x|\sqrt{1+x^2}}$
35. $\frac{d}{dx}(\tanh^{-1} x) = \frac{1}{1-x^2}$
36. $\frac{d}{dx}(\coth^{-1} x) = \frac{1}{1-x^2}$

Integration Rules

1. $\int c \cdot f(x) dx = c \int f(x) dx$
2. $\int f(x) \pm g(x) dx = \int f(x) dx \pm \int g(x) dx$
3. $\int 0 dx = C$
4. $\int 1 dx = x + C$
5. $\int x^n dx = \frac{1}{n+1}x^{n+1} + C, n \neq -1$
6. $\int e^x dx = e^x + C$
7. $\int \ln x dx = x \ln x - x + C$
8. $\int a^x dx = \frac{1}{\ln a} \cdot a^x + C$
9. $\int \frac{1}{x} dx = \ln|x| + C$
10. $\int \cos x dx = \sin x + C$
11. $\int \sin x dx = -\cos x + C$
12. $\int \tan x dx = -\ln|\cos x| + C$
13. $\int \sec x dx = \ln|\sec x + \tan x| + C$
14. $\int \csc x dx = -\ln|\csc x + \cot x| + C$
15. $\int \cot x dx = \ln|\sin x| + C$
16. $\int \sec^2 x dx = \tan x + C$
17. $\int \csc^2 x dx = -\cot x + C$
18. $\int \sec x \tan x dx = \sec x + C$
19. $\int \csc x \cot x dx = -\csc x + C$
20. $\int \cos^2 x dx = \frac{1}{2}x + \frac{1}{4}\sin(2x) + C$
21. $\int \sin^2 x dx = \frac{1}{2}x - \frac{1}{4}\sin(2x) + C$
22. $\int \frac{1}{x^2+a^2} dx = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) + C$
23. $\int \frac{1}{\sqrt{a^2-x^2}} dx = \sin^{-1}\left(\frac{x}{a}\right) + C$
24. $\int \frac{1}{x\sqrt{x^2-a^2}} dx = \frac{1}{a} \sec^{-1}\left(\frac{|x|}{a}\right) + C$
25. $\int \cosh x dx = \sinh x + C$
26. $\int \sinh x dx = \cosh x + C$
27. $\int \tanh x dx = \ln(\cosh x) + C$
28. $\int \coth x dx = \ln|\sinh x| + C$
29. $\int \frac{1}{\sqrt{x^2-a^2}} dx = \ln|x + \sqrt{x^2-a^2}| + C$
30. $\int \frac{1}{\sqrt{x^2+a^2}} dx = \ln|x + \sqrt{x^2+a^2}| + C$
31. $\int \frac{1}{a^2-x^2} dx = \frac{1}{2a} \ln\left|\frac{a+x}{a-x}\right| + C$
32. $\int \frac{1}{x\sqrt{a^2-x^2}} dx = \frac{1}{a} \ln\left(\frac{x}{a + \sqrt{a^2-x^2}}\right) + C$
33. $\int \frac{1}{x\sqrt{x^2+a^2}} dx = \frac{1}{a} \ln\left|\frac{x}{a + \sqrt{x^2+a^2}}\right| + C$

Summation Formulas:

$$\sum_{i=1}^n c = cn$$

$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^n i^3 = \left(\frac{n(n+1)}{2}\right)^2$$

APEX CALCULUS
Version 4.0

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