

Calculus I

Basic Differentiation and Integration rules

1. $\frac{d}{dx}[cu] = cu'$
2. $\frac{d}{dx}[u \pm v] = u' \pm v'$
3. $\frac{d}{dx}[uv] = uv' \pm vu'$
4. $\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{vu' - uv'}{v^2}$
5. $\frac{d}{dx}[c] = 0$
6. $\frac{d}{dx}[u^n] = nu^{n-1}u'$
7. $\frac{d}{dx}[x] = 1$
8. $\frac{d}{dx}[\ln u] = \frac{1}{u}(u')$
9. $\frac{d}{dx}[e^u] = e^u u'$
10. $\frac{d}{dx}[\log_a u] = \frac{1}{(\ln a)u}(u')$
11. $\frac{d}{dx}[a^u] = (\ln a)a^u u'$
12. $\frac{d}{dx}[\sin u] = (\cos u)u'$
13. $\frac{d}{dx}[\cos u] = -(\sin u)u'$
14. $\frac{d}{dx}[\tan u] = (\sec^2 u)u'$
15. $\frac{d}{dx}[\cot u] = -(\csc^2 u)u'$
16. $\frac{d}{dx}[\sec u] = (\sec u \tan u)u'$
17. $\frac{d}{dx}[\csc u] = -(\csc u \cot u)u'$
18. $\frac{d}{dx}[\sin^{-1} u] = \frac{1}{\sqrt{1-u^2}}u'$
19. $\frac{d}{dx}[\sec^{-1} u] = \frac{1}{|u|\sqrt{u^2-1}}u'$
20. $\frac{d}{dx}[\tan^{-1} u] = \frac{1}{1+u^2}u'$
21. $\frac{d}{dx}[\cos^{-1} u] = \frac{-1}{\sqrt{1-u^2}}u'$
22. $\frac{d}{dx}[\cot^{-1} u] = \frac{-1}{1+u^2}u'$
23. $\frac{d}{dx}[\csc^{-1} u] = \frac{-1}{|u|\sqrt{u^2-1}}u'$
24. $\int kf(u) du = k \int f(u) du$
25. $\int [f(u) \pm g(u)] du = \int f(u) du \pm \int g(u) du$
26. $\int du = u + c$
27. $\int u^n du = \frac{u^{n+1}}{n+1} + c \quad n \neq -1$
28. $\int \frac{1}{u} du = \ln|u| + c$
29. $\int e^u du = e^u + c$
30. $\int a^u du = \frac{1}{\ln a} a^u + c$
31. $\int \sin u du = -\cos u + c$
32. $\int \cos u du = \sin u + c$
33. $\int \tan u du = -\ln|\cos u| + c$
34. $\int \cot u du = \ln|\sin u| + c$
35. $\int \sec u du = \ln|\sec u + \tan u| + c$
36. $\int \csc u du = -\ln|\csc u + \cot u| + c$
37. $\int \sec^2 u du = \tan u + c$
38. $\int \csc^2 u du = -\cot u + c$
39. $\int \sec u \tan u du = \sec u + c$
40. $\int \csc u \cot u du = -\csc u + c$
41. $\int \frac{1}{\sqrt{a^2 - u^2}} du = \sin^{-1}\left(\frac{u}{a}\right) + c$
42. $\int \frac{1}{a^2 + u^2} du = \frac{1}{a} \tan^{-1}\left(\frac{u}{a}\right) + c$
43. $\int \frac{1}{u\sqrt{u^2 - a^2}} du = \frac{1}{a} \sec^{-1}\left(\frac{|u|}{a}\right) + c$

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$$44. \frac{d}{dx}[\sinh u] = (\cosh u)u'$$

$$45. \frac{d}{dx}[\cosh u] = (\sinh u)u'$$

$$46. \frac{d}{dx}[\tanh u] = (\operatorname{sech}^2 u)u'$$

$$47. \frac{d}{dx}[\operatorname{coth} u] = -(\operatorname{csch}^2 u)u'$$

$$48. \frac{d}{dx}[\operatorname{sech} u] = -(\operatorname{sech} u \tanh u)u'$$

$$49. \frac{d}{dx}[\operatorname{csch} u] = -(\operatorname{csch} u \operatorname{coth} u)u'$$

$$50. \int \cosh u \, du = \sinh u + c$$

$$51. \int \sinh u \, du = \cosh u + c$$

$$52. \int \operatorname{sech}^2 u \, du = \tanh u + c$$

$$53. \int \operatorname{csch}^2 u \, du = -\operatorname{coth} u + c$$

$$54. \int \operatorname{sech} u \tanh u \, du = -\operatorname{sech} u + c$$

$$55. \int \operatorname{csch} u \operatorname{coth} u \, du = -\operatorname{csch} u + c$$