



0.1 Basic Integration Formulas

1. $\int \frac{dx}{x} = \ln|x| + C$
2. $\int x^n dx = \frac{1}{n+1}x^{n+1} + C \quad n \neq -1$
3. $\int a^x dx = \frac{1}{\ln a}a^x + C$
4. $\int e^x dx = e^x + C$
5. $\int \sin x dx = -\cos x + C$
6. $\int \cos x dx = \sin x + C$
7. $\int \tan x dx = \ln|\sec x| + C$
8. $\int \cot x dx = \ln|\sin x| + C$
9. $\int \sec x dx = \ln|\sec x + \tan x| + C$
10. $\int \csc x dx = \ln|\csc x - \cot x| + C$
11. $\int \sec x \tan x dx = \sec x + C$
12. $\int \csc x \cot x dx = -\csc x + C$
13. $\int \sec^2 x dx = \tan x + C$
14. $\int \csc^2 x dx = -\cot x + C$
15. $\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1}\left(\frac{x}{a}\right) + C$
16. $\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a} \sec^{-1}\left(\frac{x}{a}\right) + C$
17. $\int \frac{dx}{a^2 + x^2} = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) + C$
18. $\int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \ln\left|\frac{x-a}{x+a}\right| + C$
19. $\int \frac{dx}{\sqrt{x^2 + a^2}} = \ln|x + \sqrt{x^2 + a^2}| + C$
20. $\int \frac{dx}{\sqrt{x^2 - a^2}} = \ln|x + \sqrt{x^2 - a^2}| + C$
19. $\int \frac{dx}{\sqrt{x^2 + a^2}} = \ln\left|\frac{x + \sqrt{x^2 + a^2}}{a}\right| + C$
20. $\int \frac{dx}{\sqrt{x^2 - a^2}} = \ln\left|\frac{x + \sqrt{x^2 - a^2}}{a}\right| + C$
21. $\int \cosh x dx = \sinh x + C$
22. $\int \sinh x dx = \cosh x + C$
23. $\int \sqrt{x^2 + a^2} dx = \frac{x}{2}\sqrt{x^2 + a^2} + \ln|x + \sqrt{x^2 + a^2}| + C$
24. $\int \sqrt{x^2 - a^2} dx = \frac{x}{2}\sqrt{x^2 - a^2} + \ln|x + \sqrt{x^2 - a^2}| + C$
23. $\int \sqrt{x^2 + a^2} dx = \frac{x}{2}\sqrt{x^2 + a^2} + \ln\left|\frac{x + \sqrt{x^2 + a^2}}{a}\right| + C$
24. $\int \sqrt{x^2 - a^2} dx = \frac{x}{2}\sqrt{x^2 - a^2} + \ln\left|\frac{x + \sqrt{x^2 - a^2}}{a}\right| + C$
25. $\int \sqrt{a^2 - x^2} dx = \frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1}\left(\frac{x}{a}\right) + C$



0.2 Advance Basic Integration Formulas

If the integrand is a function whose differential also occurs, apart from the constant factor.

1. $\int \frac{f'(x)dx}{f(x)} = \ln |f(x)| + C$
3. $\int a^{f(x)} j'(x) dx = \frac{1}{\ln a} a^{f(x)} + C$
5. $\int \sin (f(x)) f'(x) dx = -\cos (f(x)) + C$
7. $\int \tan (f(x)) f'(x) dx = \ln |\sec (f(x))| + C$
9. $\int \sec (f(x)) f'(x) dx = \ln |\sec (f(x)) + \tan (f(x))| + C$
11. $\int \sec (j'(x)) \tan (f(x)) f'(x) dx = \sec (f(x)) + C$
13. $\int \sec ^2 (f(x)) f'(x) dx = \tan (f(x)) + C$
15. $\int \frac{f'(x) dx}{\sqrt{a^2 - [f(x)]^2}} = \sin^{-1} \left(\frac{f(x)}{a} \right) + C$
17. $\int \frac{f'(x) dx}{a^2 + [f(x)]^2} = \frac{1}{a} \tan^{-1} \left(\frac{f(x)}{a} \right) + C$
19. $\int \frac{f'(x) dx}{\sqrt{[f(x)]^2 + a^2}} = \ln \left| f(x) + \sqrt{[f(x)]^2 + a^2} \right| + C$
19. $\int \frac{f'(x) dx}{\sqrt{[f(x)]^2 + a^2}} = \ln \left| \frac{f(x) + \sqrt{[f(x)]^2 + a^2}}{a} \right| + C$
21. $\int \cosh (f(x)) f'(x) dx = \sinh (f(x)) + C$
23. $\int \sqrt{[f(x)]^2 + a^2} f'(x) dx = \frac{f(x)}{2} \sqrt{[f(x)]^2 + a^2} + \ln \left| x + \sqrt{[f(x)]^2 + a^2} \right| + C$
23. $\int \sqrt{[f(x)]^2 + a^2} f'(x) dx = \frac{f(x)}{2} \sqrt{[f(x)]^2 + a^2} + \ln \left| \frac{f(x) + \sqrt{[f(x)]^2 + a^2}}{a} \right| + C$
24. $\int \sqrt{[f(x)]^2 - a^2} f'(x) dx = \frac{f(x)}{2} \sqrt{[f(x)]^2 - a^2} + \ln \left| f(x) + \sqrt{[f(x)]^2 - a^2} \right| + C$
24. $\int \sqrt{[f(x)]^2 - a^2} f'(x) dx = \frac{f(x)}{2} \sqrt{[f(x)]^2 - a^2} + \ln \left| \frac{f(x) + \sqrt{[f(x)]^2 - a^2}}{a} \right| + C$
25. $\int \sqrt{a^2 - [f(x)]^2} f'(x) dx = \frac{f(x)}{2} \sqrt{[f(x)]^2 + a^2} + \frac{a^2}{2} \sin^{-1} \left(\frac{f(x)}{a} \right) + C$
26. $\int b^{ax} dx = \frac{1}{a \ln b} b^x + C$
27. $\int e^{ax} dx = \frac{1}{a} e^{ax} + C$
28. $\int \sin (ax) dx = -\frac{1}{a} \cos (ax) + C$
29. $\int \cos (ax) dx = \frac{1}{a} \sin (ax) + C$
30. $\int \tan (ax) dx = \frac{1}{a} \ln |\sec (ax)| + C$
31. $\int \cot (ax) dx = \frac{1}{a} \ln |\sin (ax)| + C$
32. $\int \sec (cx) dx = \frac{1}{a} \ln |\sec (ax) + \tan (ax)| + C$
33. $\int \csc (ax) dx = \frac{1}{a} \ln |\csc (ax) - \cot (ax)| + C.$
34. $\int \sec (cx) \tan (ax) dx = \frac{1}{a} \sec (ax) + C$
35. $\int \csc (ax) \cot (ax) dx = -\frac{1}{a} \csc (ax) + C$
36. $\int \sec ^2 (ax) dx = \frac{1}{a} \tan (ax) + C$
37. $\int \csc ^2 (ax) dx = -\frac{1}{a} \cot (ax) + C$
2. $\int [f(x)]^n f'(x) dx = \frac{1}{n+1} [f(x)]^{n+1} + C \quad n \neq -1$
4. $\int e^{f(x)} f'(x) dx = e^{f(x)} + C$
6. $\int \cos (f(x)) f'(x) dx = \sin (f(x)) + C$
8. $\int \cot (f(x)) f'(x) dx = \ln |\sin (f(x))| + C$
10. $\int \csc (f(x)) f'(x) dx = \ln |\csc (f(x)) - \cot (f(x))| + C.$
12. $\int \csc (f(x)) \cot (f(x)) f'(x) dx = -\csc (f(x)) + C$
14. $\int \csc ^2 (f(x)) f'(x) dx = -\cot (f(x)) + C$
16. $\int \frac{f'(x) dx}{f(x) \sqrt{[f(x)]^2 - a^2}} = \frac{1}{a} \sec^{-1} \left(\frac{f(x)}{a} \right) + C$
18. $\int \frac{f(x) dx}{[f(x)]^2 - a^2} = \frac{1}{2a} \ln \left| \frac{f(x) - a}{f(x) + a} \right| + C$
20. $\int \frac{f'(x) dx}{\sqrt{[f(x)]^2 - a^2}} = \ln \left| f(x) + \sqrt{[f(x)]^2 - a^2} \right| + C$
20. $\int \frac{f'(x) dx}{\sqrt{[f(x)]^2 - a^2}} = \ln \left| \frac{f(x) + \sqrt{[f(x)]^2 - a^2}}{a} \right| + C$
22. $\int \sinh (f(x)) f'(x) dx = \cosh (f(x)) + C$