Integration Formulas

Definition of a Improper Integral

$\int_a^b f(x)\,dx$ is an improper integral if

1. f becomes infinite at one or more points of the interval of integration, or
2. one or both of the limits of integration is infinite, or
3. both (1) and (2) hold.

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