Basic Integration Formulas

$\int 1\, dx = x + C$

$\int a\, dx = ax + C$

$\int x^n\, dx = ((x^{n+1})/(n+1)) + C\ ;\ n \neq 1$

$\int \sin x\, dx = -\cos x + C$

$\int \cos x\, dx = \sin x + C$

$\int \sec^2 x\, dx = \tan x + C$

$\int \csc^2 x\, dx = -\cot x + C$

$\int \sec x\, (\tan x)\, dx = \sec x + C$

$\int \csc x\, (\cot x)\, dx = -\csc x + C$

$\int (1/x)\, dx = \ln |x| + C$

$\int e^x\, dx = e^x + C$

$\int a^x\, dx = (a^x/\ln a) + C\ ;\ a>0,\ a \neq 1$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C$$

$$\int \frac{1}{x} dx = \ln|x| + C$$

$$\int c\, dx = cx + C$$

$$\int x dx = \frac{x^2}{2} + C$$

$$\int x^2 dx = \frac{x^3}{3} + C$$

$$\int \frac{1}{x^2} dx = -\frac{1}{x} + C$$

$$\int \sqrt{x} dx = \frac{2x\sqrt{x}}{3} + C$$

$$\int \sin x dx = -\cos x$$

$$\int \cos x dx = -\sin x$$

$$\int \sin^2 x dx = \frac{x}{2} - \frac{1}{4} \sin 2x$$

$$\int \cos^2 x dx = \frac{x}{2} + \frac{1}{4} \sin 2x$$

$$\int \sin^3 x dx = \frac{1}{3} \cos^3 x - \cos x$$

$$\int \cos^3 x dx = \sin x - \frac{1}{3} \sin^3 x$$

$$\int \frac{dx}{\sin x} x dx = \ln \left| \tan \frac{x}{2} \right|$$

$$\int \frac{dx}{\cos x} x dx = \ln \left| \tan \left(\frac{x}{2} + \frac{\pi}{4} \right) \right|$$

$$\int \tan x\, dx = -\ln|\cos x| + C$$

$$\int \cot x\, dx = \ln|\sin x| + C$$

$$\int \sec x\, dx = \ln|\sec x + \tan x| + C$$

$$\int \csc x\, dx = -\ln|\csc x + \cot x| + C$$

$$\int \sec^2 x\, dx = \tan x + C$$

$$\int \csc^2 x\, dx = -\cot x + C$$

$$\int \sec x \tan x\, dx = \sec x + C$$

$$\int \csc x \cot x\, dx = -\csc x + C$$

$$\int \sin^2 x \cos^2 x dx = \frac{x}{8} - \frac{1}{32}\sin 4x$$

$$\int \tan x dx = -\ln|\cos x|$$

$$\int \frac{\sin x}{\cos^2 x} dx = \frac{1}{\cos x}$$

$$\int \frac{\sin^2 x}{\cos x} dx = \ln\left|\tan\left(\frac{x}{2} + \frac{\pi}{4}\right)\right| - \sin x$$

$$\int \tan^2 x dx = \tan x - x$$

$$\int \cot x dx = \ln|\sin x|$$

$$\int \frac{\cos x}{\sin^2 x} dx = -\frac{1}{\sin x}$$

$$\int \frac{\cos^2 x}{\sin x} dx = \ln\left|\tan\frac{x}{2}\right| + \cos x$$

$$\int \cot^2 x dx = -\cot x - x$$

$$\int \frac{dx}{\sin x \cos x} = \ln|\tan x|$$

$$\int \frac{dx}{\sin^2 x \cos x} = -\frac{1}{\sin x} + \ln\left|\tan\left(\frac{x}{2} + \frac{\pi}{4}\right)\right|$$

$$\int \frac{dx}{\sin x \cos^2 x} = \frac{1}{\cos x} + \ln\left|\tan\frac{x}{2}\right|$$

$$\int \frac{dx}{\sin^2 x \cos^2 x} = \tan x - \cot x$$

$$\int \frac{1}{(x^2 - a^2)} dx = \frac{1}{2a} . log\left|\frac{(x-a)}{(x+a)}\right| + C$$

$$\int \frac{1}{(a^2 - x^2)} dx = \frac{1}{2a} . log\left|\frac{(a+x)}{(a-x)}\right| + C$$

$$\int \frac{1}{(x^2 + a^2)} dx = \frac{1}{a} tan^{-1}\left(\frac{x}{a}\right) + C$$

$$\int \frac{1}{\sqrt{x^2 - a^2}} dx = log|x + \sqrt{x^2 - a^2}| + C$$

$$\int \frac{1}{\sqrt{a^2 - x^2}} dx = sin^{-1}\left(\frac{x}{a}\right) + C$$

$$\int \frac{1}{\sqrt{x^2 + a^2}} dx = log|x + \sqrt{x^2 + a^2}| + C$$

$$\int \frac{dx}{\sin^2 x} xdx = -\cot x$$

$$\int \frac{dx}{\cos^2 x} xdx = \tan x$$

$$\int \frac{dx}{\sin^3 x} = -\frac{\cos x}{2\sin^2 x} + \frac{1}{2}\ln\left|\tan\frac{x}{2}\right|$$

$$\int \frac{dx}{\cos^3 x} = \frac{\sin x}{2\cos^2 x} + \frac{1}{2}\ln\left|\tan\left(\frac{x}{2} + \frac{\pi}{4}\right)\right|$$

$$\int \sin x \cos x dx = -\frac{1}{4}\cos 2x$$

$$\int \sin^2 x \cos x dx = \frac{1}{3}\sin^3 x$$

$$\int \sin x \cos^2 x dx = -\frac{1}{3}\cos^3 x$$

$$\int \sin x \cos^n x dx = -\frac{\cos^{n+1} x}{n+1}$$

$$\int \sin^n x \cos x dx = \frac{\sin^{n+1} x}{n+1}$$

$$\int \arcsin x dx = x \arcsin x + \sqrt{1 - x^2}$$

$$\int \arccos x dx = x \arccos x - \sqrt{1 - x^2}$$

$$\int \arctan x dx = x \arctan x - \frac{1}{2}\ln\left(x^2 + 1\right)$$

$$\int \operatorname{arc}\cot x dx = x \operatorname{arc}\cot x + \frac{1}{2}\ln\left(x^2 + 1\right)$$

$$\int \sin mx \sin nx dx = -\frac{\sin(m+n)x}{2(m+n)} + \frac{\sin(m-n)x}{2(m-n)} \qquad m^2 \neq n^2$$

$$\int \sin mx \cos nx dx = -\frac{\cos(m+n)x}{2(m+n)} - \frac{\cos(m-n)x}{2(m-n)} \qquad m^2 \neq n^2$$

$$\int \cos mx \cos nx dx = \frac{\sin(m+n)x}{2(m+n)} + \frac{\sin(m-n)x}{2(m-n)} \qquad m^2 \neq n^2$$

Division Rule

$$\frac{d}{dx}\left(\frac{u}{v}\right)$$

$$\Rightarrow \frac{v\frac{d}{dx}u - u\frac{d}{dx}v}{v^2}$$

Multiplication Rule

$$\int uv\,dx = u\int v\,dx - \int\left\{\frac{du}{dx}\left(\int v\,dx\right)\right\}dx$$

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Inverse Trignometric Functions — Logarithmic functions — Algebraic functions — Trigonometric functions — Exponential functions

Integration by parts

S.No.	Form of the rational function	Form of the partial fraction
1.	$\frac{px+q}{(x-a)(x-b)}$, $a \neq b$	$\frac{A}{x-a}+\frac{B}{x-b}$
2.	$\frac{px+q}{(x-a)^2}$	$\frac{A}{x-a}+\frac{B}{(x-a)^2}$
3.	$\frac{px^2+qx+r}{(x-a)(x-b)(x-c)}$	$\frac{A}{x-a}+\frac{B}{x-b}+\frac{C}{x-c}$
4.	$\frac{px^2+qx+r}{(x-a)^2(x-b)}$	$\frac{A}{x-a}+\frac{B}{(x-a)^2}+\frac{C}{x-b}$
5.	$\frac{px^2+qx+r}{(x-a)(x^2+bx+c)}$	$\frac{A}{x-a}+\frac{Bx+C}{x^2+bx+c}$
	• where $x^2 + bx + c$ cannot be factorised further	