Maths Formula Sheet

Chapter by chapter, topic by topic. Written by the PadhoNa team for quick revision.

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CHAPTER 19

Indefinite Integration

Standard integrals

$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C\ (n \neq -1), \qquad \int \frac{dx}{x} = \ln|x| + C, \qquad \int e^x dx = e^x + C,$$

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

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

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

Special integrals

$$\int \frac{dx}{x^2 + a^2} = \frac{1}{a}\tan^{-1}\frac{x}{a} + C, \qquad \int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1}\frac{x}{a} + C$$

$$\int \frac{dx}{x^2 - a^2} = \frac{1}{2a}\ln\left|\frac{x-a}{x+a}\right| + C, \qquad \int \frac{dx}{a^2 - x^2} = \frac{1}{2a}\ln\left|\frac{a+x}{a-x}\right| + C$$

$$\int \frac{dx}{\sqrt{x^2 \pm a^2}} = \ln\left|x + \sqrt{x^2 \pm a^2}\right| + C$$

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

$$\int \sqrt{x^2 \pm a^2}\,dx = \frac{x}{2}\sqrt{x^2 \pm a^2} \pm \frac{a^2}{2}\ln\left|x + \sqrt{x^2 \pm a^2}\right| + C$$

$$\int e^{ax}\sin bx\,dx = \frac{e^{ax}}{a^2+b^2}(a\sin bx - b\cos bx) + C$$

Methods

BY PARTS

$$\int u\,v\,dx = u\int v\,dx - \int\left(u'\int v\,dx\right)dx$$

Choose u in the order ILATE: inverse trig, log, algebraic, trig, exponential.

$$\int e^x\big(f(x)+f'(x)\big)dx = e^x f(x) + C$$

SUBSTITUTION

$$\int f(g(x))\,g'(x)\,dx = \int f(t)\,dt, \qquad t = g(x)$$

$$\int \frac{f'(x)}{f(x)}dx = \ln|f(x)| + C, \qquad \int \frac{f'(x)}{\sqrt{f(x)}}dx = 2\sqrt{f(x)} + C$$

RATIONAL FUNCTIONS

$$\frac{P(x)}{(x-a)(x-b)} = \frac{A}{x-a} + \frac{B}{x-b}$$

Use partial fractions after making the numerator's degree less than the denominator's.

TRIG FORM

$$\int \frac{dx}{a+b\cos x}: \quad t = \tan\frac{x}{2},\ \cos x = \frac{1-t^2}{1+t^2},\ dx = \frac{2\,dt}{1+t^2}$$

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