Maths Formula Sheet

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

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CHAPTER 20

Definite Integration

Properties

$$\int_a^b f(x)\,dx = \int_a^b f(a+b-x)\,dx, \qquad \int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$$

$$\int_{-a}^{a} f(x)\,dx = \begin{cases} 2\int_0^a f(x)\,dx, & f \text{ even} \\ 0, & f \text{ odd} \end{cases}$$

$$\int_0^{2a} f(x)\,dx = \begin{cases} 2\int_0^a f(x)\,dx, & f(2a-x) = f(x) \\ 0, & f(2a-x) = -f(x) \end{cases}$$

PERIODIC

$$\int_0^{nT} f(x)\,dx = n\int_0^T f(x)\,dx$$

KING'S RULE EXAMPLE

$$\int_0^{\pi/2} \frac{\sin^n x}{\sin^n x + \cos^n x}dx = \frac{\pi}{4}$$

Newton–Leibniz rule

$$\frac{d}{dx}\int_{g(x)}^{h(x)} f(t)\,dt = f(h(x))\,h'(x) - f(g(x))\,g'(x)$$

Limit as a sum

$$\lim_{n\to\infty}\frac{1}{n}\sum_{r=1}^{n} f\left(\frac{r}{n}\right) = \int_0^1 f(x)\,dx$$

Standard results

WALLIS

$$\int_0^{\pi/2} \sin^n x\,dx = \frac{n-1}{n}\cdot\frac{n-3}{n-2}\cdots\times\begin{cases}\frac{\pi}{2}, & n \text{ even}\\ 1, & n \text{ odd}\end{cases}$$

$$\int_0^{\pi/2} \ln\sin x\,dx = -\frac{\pi}{2}\ln 2$$

SPECIAL FUNCTIONS

$$\int_a^b [x]\,dx : \text{split at integers;} \qquad \int |f(x)|\,dx : \text{split where } f = 0$$

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