

# ☒ Class 12 Mathematics – Chapter: Integrals

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## 1. Introduction

- Integration is the reverse process of differentiation.
  - It helps in finding areas under curves, among other applications.
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## 2. Indefinite Integrals

- The integral of a function without limits.
- Represented as:

$$\int f(x) dx = F(x) + C \quad \int f(x) \, dx = F(x) + C$$

where  $F'(x) = f(x)$  and  $C$  is the constant of integration.

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## 3. Basic Integration Formulas

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

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

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

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

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

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

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

## 4. Properties of Integrals

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$$\int [f(x) + g(x)] dx = \int f(x) dx + \int g(x) dx \quad \int [f(x) + g(x)] dx = \int f(x) dx + \int g(x) dx$$

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$$\int k f(x) dx = k \int f(x) dx \quad \int k \cdot f(x) dx = k \int f(x) dx, \text{ where } k \text{ is constant.}$$

## 5. Definite Integrals (Introduction)

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Integration with limits  $a$  to  $b$ .

- Represents area under the curve  $f(x)$  from  $x=a$  to  $x=b$ .
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## 6. Applications of Integration

- Finding areas under curves.
  - Solving problems in physics and engineering.
  - Calculating accumulated quantities.
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## 7. Exam Tips

- Memorize basic formulas.
- Practice integrating polynomial, trigonometric, and exponential functions.
- Understand the concept of constant of integration.
- Work on simple definite integral problems.