

Chapter 7 Class 12

Integration Formula Sheet

by [teachoo.com](https://www.teachoo.com)

Basic Formulae

1. $\int x^n dx = \frac{x^{n+1}}{n+1} + C, n \neq -1$. Particularly, $\int dx = x + c$

2. $\int \cos x dx = \sin x + C$

3. $\int \sin x dx = -\cos x + C$

4. $\int \sec^2 x dx = \tan x + c$

5. $\int \operatorname{cosec}^2 x dx = -\cot x + c$

6. $\int \sec x \tan x dx = \sec x + c$

7. $\int \operatorname{cosec} x \cot x dx = -\operatorname{cosec} x + c$

8. $\int \frac{dx}{\sqrt{1-x^2}} = \sin^{-1} x + c$

9. $\int \frac{dx}{\sqrt{1-x^2}} = -\cos^{-1} x + c$

10. $\int \frac{dx}{1+x^2} = \tan^{-1} x + c$

Questions in
[Ex 7.2](#) and [Ex 7.3](#)

$$11. \int \frac{dx}{1+x^2} = -\cot^{-1} x + c$$

$$12. \int e^x dx = e^x + c$$

$$13. \int a^x dx = \frac{a^x}{\log a} + c$$

$$14. \int \frac{dx}{x\sqrt{x^2-1}} = \sec^{-1} x + c$$

$$15. \int \frac{dx}{x\sqrt{x^2-1}} = -\operatorname{cosec}^{-1} x + c$$

$$16. \int \frac{1}{x} dx = \log |x| + c$$

$$17. \int \tan x dx = \log |\sec x| + c$$

$$18. \int \cot x dx = \log |\sin x| + c$$

$$19. \int \sec x dx = \log |\sec x + \tan x| + c$$

$$20. \int \operatorname{cosec} x dx = \log |\operatorname{cosec} x - \cot x| + c$$

Integrals of some special functions

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

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

$$3. \int \frac{dx}{x^2 + a^2} = \frac{1}{a} \tan^{-1} \frac{x}{a} + c$$

$$4. \int \frac{dx}{\sqrt{x^2 - a^2}} = \log \left| x + \sqrt{x^2 - a^2} \right| + C$$

$$5. \int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1} \frac{x}{a} + c$$

$$6. \int \frac{dx}{\sqrt{x^2 + a^2}} = \log \left| x + \sqrt{x^2 + a^2} \right| + C$$

Questions in
[Ex 7.4](#)

Integrals by partial fractions

$$1. \frac{px + q}{(x - a)(x - b)} = \frac{A}{x - a} + \frac{B}{x - b}, \quad a \neq b$$

$$2. \frac{px + q}{(x - a)^2} = \frac{A}{x - a} + \frac{B}{(x - a)^2}$$

$$3. \frac{px^2 + qx + r}{(x - a)(x - b)(x - c)} = \frac{A}{x - a} + \frac{B}{x - b} + \frac{C}{x - c}$$

$$4. \frac{px^2 + qx + r}{(x - a)^2(x - b)} = \frac{A}{x - a} + \frac{B}{(x - a)^2} + \frac{C}{x - b}$$

$$5. \frac{px^2 + qx + r}{(x - a)(x^2 + bx + c)} = \frac{A}{x - a} + \frac{Bx + C}{x^2 + bx + c}$$

Questions in
Ex 7.5

Where $x^2 + bx + c$ can not be factorised further.

Integration by parts

$$1. \int f(x) g(x) dx = f(x) \int g(x) dx - \int (f'(x) \int g(x) dx) dx$$

To decide first function. We use

I → Inverse (Example $\sin^{-1} x$)

L → Log (Example $\log x$)

A → Algebra (Example x^2, x^3)

T → Trigonometry (Example $\sin^2 x$)

E → Exponential (Example e^x)

Questions in
[Ex 7.6](#)

$$2. \int e^x [f(x) + f'(x)] dx = \int e^x f(x) dx + C$$

Other Special Integrals

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

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

$$3. \int \sqrt{a^2 - x^2} \, dx = \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \frac{x}{a} + C$$

Questions in

[Ex 7.7](#)

Integral of the form

$$\int (px + q)\sqrt{ax^2 + bx + c} dx$$

We solve this using a specific method.

1. First we write

$$px + q = A \left(\frac{d(\sqrt{ax^2 + bx + c})}{dx} \right) + B$$

2. Then we find A and B

3. Our equation becomes two separate identities and then we solve.

Some examples are

- $(x + 3)\sqrt{3 - 4x - x^2} - \text{View solution}$
- $x\sqrt{1 + x - x^2} dx - \text{View Solution}$

Questions in
[Ex 7.7](#)

Area as a sum

$$\int f(x) dx$$

$$= (b - a) \lim_{n \rightarrow \infty} \frac{1}{n} (f(a) + f(a + h) + f(a + 2h) \dots +$$

teachoo

Questions in
[Ex 7.8](#)

Properties of definite integration

$$P_0 : \int_a^b f(x)dx = \int_a^b f(t)dt$$

$$P_1 : \int_a^b f(x)dx = - \int_b^a f(x)dx . \text{ In particular, } \int_a^a f(x)dx = 0$$

$$P_2 : \int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$$

$$P_3 : \int_a^b f(x)dx = \int_a^b f(a + b - x)dx.$$

$$P_4 : \int_0^a f(x)dx = \int_0^a f(a - x)dx$$

$$P_5 : \int_0^{2a} f(x)dx = \int_0^a f(x)dx + \int_0^a f(2a - x)dx$$

$$P_6 : \int_0^{2a} f(x) = \begin{cases} 2 \int_0^a f(x)dx, & \text{if } f(2a - x) = f(x) \\ 0, & \text{if } f(2a - x) = -f(x) \end{cases}$$

$$P_6 : \int_{-a}^a f(x) = \begin{cases} 2 \int_0^a f(x)dx, & \text{if } f(-x) = f(x) \\ 0, & \text{if } f(-x) = -f(x) \end{cases}$$

Questions in
[Ex 7.11](#)