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Mathematics: Integral Formula, List of Integral Formulas (For CBSE, ICSE, IAS, NET, NRA 2022)

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Integral Formulas –

Integration can be considered as the reverse process of differentiation or can be called Inverse Differentiation. Integration is the process of finding a function with its derivative. Basic integration formulas on different functions are mentioned here. Apart from the formulas for integration, classification of integral formulas and a few sample questions are also given here, which you can practice based on the integration formulas mentioned in this article. When we speak about integration by parts, it is regarding integrating the product of two functions, say $y = uv$. Some more concepts related to integral calculus are given, so keep learning integral formulas to solve problems accurately. Also, watch the video given below to clear your concept.

List of Integral Formulas

- The list of integral formulas is

- $\int 1 dx = x + C$

- $\int a dx = ax + C$

- $\int x^n dx = \left(\frac{x^{n+1}}{n+1} \right) + C; n \neq -1$

- $\int (\sin x) dx = -\cos x + C$

- $\int (\cos x) dx = \sin x + C$

- $\int (\sec^2 x) dx = \tan x + C$ $\int (\csc^2 x) dx = -\cot x + C$

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

- $\int (\csc x (\cot x) dx) = -\csc x + C$
- $\int \left(\left(\frac{1}{x} \right) dx \right) = \ln |x| + C$
- $\int ex dx = e^x + C$
- $\int ax dx = \left(\frac{a^x}{\ln a} \right) + C; a > 0, a \neq 1$

These integral formulas are equally important as differentiation formulas. Some other important integration formulas are:

- $\int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + C$
- $\int \frac{1}{1+x^2} dx = \tan^{-1} x + C$
- $\int \left(\frac{1}{|x| \sqrt{x^2-1}} dx \right) = \sec^{-1} x + C$
- $\int \sin^n(x) dx = -\frac{1}{n} \sin^{n-1}(x) \cos(x) + \frac{n-1}{n} \int (\sin^{n-2}(x)) dx$
- $\int (\cos^n(x)) dx = \frac{1}{n} \cos^{n-1}(x) \sin(x) + \frac{n-1}{n} \int (\cos^{n-2}(x) dx)$
- $\int \tan^n(x) dx = \frac{1}{n-1} \tan^{n-1}(x) - \int \tan^{n-2}(x) dx$
- $\int \sec^n(x) \left(dx = \frac{1}{n-1} \right) \sec^{n-2}(x) \tan(x) + \frac{n-2}{n-1} \int (\sec^{n-2}(x)) dx$
- $\int \csc^n(x) dx = -\frac{1}{n-1} \csc^{n-2}(x) \cot(x) + \frac{n-2}{n-1} \int (\csc^{n-2}(x) dx)$

Classification of Integral Formulas

The above listed integral formulas are classified based on following functions,

- Rational functions
- Irrational functions
- Trigonometric functions
- Inverse trigonometric functions
- Hyperbolic functions

- Inverse hyperbolic functions
- Exponential functions
- Logarithmic functions
- Gaussian functions

Solve Using Integral Formulas

1. Calculate $\int (6x^5) dx$

Solution:

Here given,

$$\int (6x^5) dx$$

Using this formula, $\frac{x^{n+1}}{n+1} + C$

$$= \frac{6x^{5+1}}{5+1} + C$$

$$= \frac{6x^6}{6} + C$$

$$= x^6 + C$$

2. Find $\int \cos x + x dx$

Solution:

Here given,

$$\int \cos x + x dx = \int \cos x dx + \int x dx$$

$$= \sin x + \frac{x^2}{2} + C$$

3. Find $\int (x^e + e^x + e^e) dx$

Solution:

$$I = \int (x^e + e^x + e^e) dx$$

Let us split the above equation,

$$\int x^e dx + \int e^x dx + \int e^e dx$$

By the formula, we know;

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

Therefore,

$$\frac{x^{e+1}}{e+1} + \int e^x dx + \int e^e dx$$

By formula, $\int a^x dx = \frac{a^x}{\log a}$, we can write the above equation as:

$$\frac{x^{e+1}}{e+1} + \frac{e^x}{\log_e e} + \int e^e dx$$

By formula, $\int k dx = kx + c$, we write the above equation as:

$$\frac{x^{e+1}}{e+1} + \frac{e^x}{\log_e e} + \int e^e x + C$$

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