Definition.

Let $\phi(x)$ be the primitive or anti-derivative of a function f(x) defined on [a, b] i.e., $\frac{d}{dx}[\phi(x)] = f(x)$.

Then the definite integral of f(x) over [a, b] is denoted by $\int_a^b f(x)dx$ and is defined as $[\phi(b) - \phi(a)]$

i.e., $\int_a^b f(x)dx = \phi(b) - \phi(a)$. This is also called Newton Leibnitz formula.

The numbers a and b are called the limits of integration, 'a' is called the lower limit and 'b' the upper limit. The interval [a, b] is called the interval of integration. The interval [a, b] is also known as range of integration.

Important Tips

- ☞ In the above definition it does not matter which anti-derivative is used to evaluate the definite integral, because if $\int f(x)dx = \phi(x) + c,$ then

$$\int_a^b f(x)dx = [\phi(x) + c]_a^b = (\phi(b) + c) - (\phi(a) + c) = \phi(b) - \phi(a).$$

In other words, to evaluate the definite integral there is no need to keep the constant of integration.

- ☞ Every definite integral has a unique value.