

THEORY

Let $f(x)$ be a function defined on the interval $[a, b]$. Then the definite integral of $f(x)$ from a to b is denoted by

$\int_a^b f(x) dx$. The value of this integral is the area under the curve $y = f(x)$ from $x = a$ to $x = b$. The integral is a number, not a function. The integral of a function $f(x)$ from a to b is the same as the integral of $f(x)$ from b to a with a minus sign.

THEOREM 1
If $f(x)$ is a continuous function on the interval $[a, b]$, then the function $F(x)$ defined by

$$F(x) = \int_a^x f(t) dt$$

is a continuous function on the interval $[a, b]$ and its derivative is $f(x)$.

THEOREM 2
If $f(x)$ is a continuous function on the interval $[a, b]$, then

$$\int_a^b f(x) dx = F(b) - F(a)$$

where $F(x)$ is any antiderivative of $f(x)$.