FUNDAMENTAL THEOREM OF CALCULUS

FUNDAMENTAL THEOREM OF CALCULUS

THEOREM

Let F be a differentiable function with F' continuous. Then

$$\int_a^b F'(x)dx = F|_a^b = F(b) - F(a)$$

EXAMPLE

EXAMPLE

$$\int_2^5 2x\,dx$$

EXAMPLE

EXAMPLE

$$\int_2^5 x dx$$

EXAMPLE

EXAMPLE

$$\int_0^{\pi} \sin(x) dx$$

ANTI-DERIVATIVES

ANTI-DERIVATIVE

DEFINITION

A function F' is called an **anti-derivative** if $F' = f$.

FUNDAMENTAL THEOREM OF CALCULUS

THEOREM

The function

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

is an anti-derivative for f.

INDEFINITE INTEGRAL

DEFINITION

The **indefinite integral** of f is any anti-derivative and is written $\int f(x)dx$.

EXAMPLE

EXAMPLE

$$f(x) = 2x$$

COMMON INTEGRALS

COMMON INTEGRALS

$\int x^n dx = \frac{x^{n+1}}{n+1}$
$\int \sin x dx = -\cos x$
$\int \cos x dx = \sin x$
$\int e^x dx = e^x$