The Fundamental Theorem of Calculus Part 2

The Fundamental Theorem of Calculus: Part 2

If f is continuous on $[a, b]$, then

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

where F is any antiderivative of f, that is, a function such that $F' = f$.

Example 1. [Evaluating Definite Integrals]

1. Evaluate $\int_1^3 e^x \, dx$

2. Evaluate $\int_3^6 \frac{1}{x} \, dx$

Example 2. [Area Under the Curve]

1. Find the area under the parabola $y = x^2$ from 0 to 1.

2. Find the area under the cosine curve from 0 to b, where $0 \leq b \leq \pi/2$.

Example 3.

Evaluate $\int_{-1}^{2} \frac{1}{x^2}\, dx$

Example 4.

1. Evaluate $\int_0^3 \left(x^3 - 6x\right)\, dx$

2. Evaluate $\int_0^2 \left(2x^3 - 6x + \dfrac{3}{x^2+1}\right)\, dx$

3. Evaluate $\int_1^9 \dfrac{2t^2 + t^2\sqrt{t} - 1}{t^2}\, dt$