

1 6.4-The Fundamental Theorem of Calculus

Fundamental Theorem of Calculus, part I: Given f is a continuous function on $[a, b]$ and $g(x) = \int_a^b f(x) dx$, proof that g is differentiable:

Fundamental Theorem of Calculus, part II:

Examples:

Find $F'(x)$ given:

$$F(x) = \int_{\pi}^x \frac{\sin t}{t} dt$$

$$F(x) = \int_{x^2}^3 \sqrt{1+t^3} dt$$

Compute $\int_1^2 \left(x + \frac{1}{x^2}\right)^2 dx$

Compute $\int_0^\pi (\sin x + x^3 - e^x) dx$

On Your Own: Find the exact area under the graph of $f(x) = \frac{2}{1+x^2}$ from $x = 0$ to $x = \sqrt{3}$.

$$\frac{2\pi}{3}$$