

Definite Integrals II

Properties of Definite Integrals

Let a, b, c, k be constants.

- $\int_a^a f(x) dx = 0$
 - $\int_a^b f(x) dx = -\int_b^a f(x) dx$
 - $\int_a^b kf(x) dx = k \int_a^b f(x) dx$
 - $\int_a^b [f(x) \pm g(x)] dx = \int_a^b f(x) dx \pm \int_a^b g(x) dx$
 - $\int_a^c f(x) dx = \int_a^b f(x) dx + \int_b^c f(x) dx$
- Indefinite Integrals: Final answer is a function, in terms of the variable, plus a constant C .
 - Definite Integrals: Final answer is a number (don't need $+C$).

Example 1: Given that $\int_1^2 x^3 dx = \frac{15}{4}$, $\int_1^2 x^2 dx = \frac{7}{3}$, and $\int_1^2 1 dx = 1$, compute the following integral.

$$\int_1^2 (2x^3 - 4x^2 + 5) dx$$

Example 2: Given that $\int_{-3}^4 5x dx = \frac{35}{2}$, compute the following integrals.

$$\int_4^{-3} 5x dx \qquad \text{and} \qquad \int_{-3}^4 10x dx$$

Example 3: Given that $\int_{-10}^{20} g(t) dt = 50$ and $\int_{15}^{20} g(t) dt = 72$, find $\int_{-10}^{15} g(t) dt$.

DIY

1. Given that $\int_0^5 f(x) dx = 7$, $\int_5^6 f(x) dx = 3$, and $\int_0^5 g(x) dx = 9$, find the following integrals.

(a) $\int_0^6 f(x) dx$

(b) $\int_6^5 f(x) dx$

(c) $\int_0^5 3f(x) dx$

(d) $\int_0^5 (3f(x) + 2g(x)) dx$

2. Given that $\int_a^b 13f(x) dx = 3$, find $\int_a^b 7f(x) dx$.

3. Given that $\int_a^b h(t) dt = 2$, find $\int_b^a -\frac{3}{2}h(t) dt$.