Properties of Definite Integral

SUBJECT : MATHEMATICS
CHAPTER NUMBER:7
CHAPTER NAME :INTEGRALS

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Basic Properties of Definite Integral

In this section, we will study some fundamental properties of definite integrals which are very useful in evaluating integrals.

(a) $\int_a^b f(x)dx = \int_a^b f(t)dt$

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

(c) $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$, where $a < c < b$

In general $\int_a^b f(x)dx = \int_a^{c_1} f(x)dx + \int_{c_1}^{c_2} f(x)dx + \ldots + \int_{c_n}^b f(x)dx$

Where $a < c_1 < c_2 < c_3 < \ldots\ldots < c_n < b$

Basic Properties of Definite Integral

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(a) $\int_a^b f(x)dx = \int_a^b f(t)dt$ (Definite integral is independent of the symbol of variable)

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

(c) $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$, where $a < c < b$

In general $\int_a^b f(x)dx = \int_a^{c_1} f(x)dx + \int_{c_1}^{c_2} f(x)dx + \ldots + \int_{c_n}^b f(x)dx$

Where $a < c_1 < c_2 < c_3 < \ldots\ldots < c_n < b$

Example

Evaluate $\int_{-1}^{1} f(x)dx$, Where $f(x) = \begin{cases} 1-2x, & x \leq 0 \\ 1+2x, & x \geq 0 \end{cases}$

Example

Evaluate

$$\int_{-1}^{1} |x| \ dx$$

Example

Evaluate

$$\int_{-5}^{5} |x-2| dx$$

Assignment

Evaluate the following definite integrals

(a) $\int_1^4 f(x)dx$, where $f(x) = \begin{cases} 2x+8, & 1 \le x \le 2 \\ 6x, & 2 \le x \le 4 \end{cases}$

(b) $\int_0^1 |5x-3|dx$

(c) $\int_0^\pi |\cos x|dx$

(d) $\int_1^4 (|x-1|+|x-2|+|x-3|)dx$

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