

Properties of integrals

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1 Areas

$\int_a^b f(x)dx$ is the **signed area** under the curve of f

2 Linearity properties

$$\int_a^a f(x)dx = 0, \quad \int_b^a f(x)dx = - \int_a^b f(x)dx$$

$$\int_a^b f(x) \pm g(x)dx = \int_a^b f(x)dx \pm \int_a^b g(x)dx$$

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

3 Additivity Property

$$\int_a^c f(x)dx + \int_c^b f(x)dx = \int_a^b f(x)dx$$

4 Comparison Properties

$$f(x) \geq 0 \quad \Rightarrow \quad \int_a^b f(x)dx \geq 0$$

$$f(x) \leq g(x) \quad \Rightarrow \quad \int_a^b f(x)dx \leq \int_a^b g(x)dx$$

$$f(x) \leq g(x) \leq h(x) \quad \Rightarrow \quad \int_a^b f(x) dx \leq \int_a^b g(x) dx \leq \int_a^b h(x) dx$$