

Additive Property of Definite Integrals

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Example 1.1

Find the area under the graph of $y = f(x)$ from $x = -4$ to $x = 4$, where

$$f(x) = \begin{cases} x^2 + 2, & x < 1 \\ 3, & x \geq 1 \end{cases}$$

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Theorem 1.2 (Area between two curves)

Let f and g be continuous functions and suppose that $f(x) \geq g(x)$ over $[a, b]$. Then the area between the two curves from a to b is

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Example 1.3

Find the area of the region bounded by $f(x) = 2x^2 + 10$ and $g(x) = 4x + 16$.

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Example 1.4

Find the area of the region bounded by $f(x) = x^2 + 1$ and $g(x) = x - 2$ from $x = -1$ to $x = 2$.

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Example 1.5

Find the area of the region bounded by $y = 6x - x^2$ and $y = x$.

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Average Value of a Continuous Function

Definition 1.6

Let f be a continuous function over a closed interval $[a, b]$. Its average value, y_{av} is given by

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Example 1.7

Find the average value of $f(x) = \sqrt{x}$ over the interval $[0, 4]$.

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Example 1.8

Shylls, Inc., determines that its marginal revenue per day is given by $R'(t) = 100e^t$, $R(0) = 0$, where $R(t)$ is the total accumulated revenue, in dollars, on the t th day. The company's marginal cost per day is given by $C'(t) = 100 - .2t$, $C(0) = 0$, where $C(t)$ is the total accumulated cost, in dollars, on the t th day.

- 1 Find the total profit from $t = 0$ to $t = 10$.
- 2 Find the average daily profit for the first 10 days.