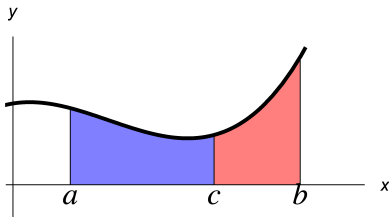


4.4 Properties of Definite Integrals

Theorem 1

Let $f(x)$ be a differentiable function on the interval $[a, b]$. Then for any number c , $a \leq c \leq b$:

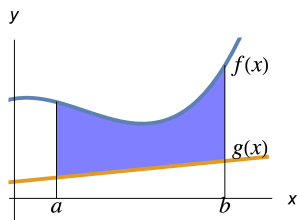


$$\int_a^b f(x) dx =$$

Example 1 Set up the integral and calculate the area in the first quadrant bounded by the graphs of $y = \sqrt{x}$ and $y = -x + 6$.

Area of a Region Bounded by Two Functions

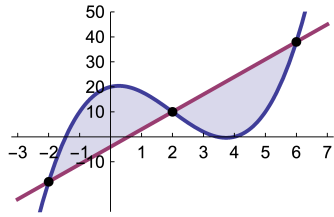
The area between two functions $f(x)$ and $g(x)$ where $f(x) \geq g(x)$ is given by



$$A =$$

Example 2 Find the area bounded by $f(x) = x^2$ and $g(x) = x + 2$

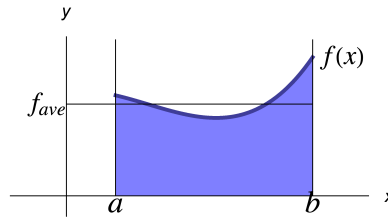
Example 3 Set up the integral to find the area bounded by $f(x) = x^3 - 6x^2 + 3x + 20$ and $g(x) = 7x - 4$



Average Value of a Function

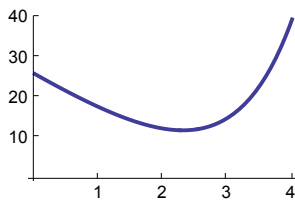
The *average value* of a function is given by

$$f_{ave} = \frac{1}{b-a} \int_a^b f(x) dx$$



Example 4 Find the average value of the function $f(x) = x^2 - 4x + 7$ on the interval $[1, 5]$

Example 5 The value of a stock varied over a 4 week period and can be approximated by the function $f(x) = e^x - 10x + 25$. Find the average value of the stock over the four week period.



Example 6 Find b such that the average value of the function $f(x) = x^2$ is 4 on the interval $[1, b]$.