

MA 231, Guided Notes §5.2

The Definite Integral (Total Signed Area): Suppose that $f(x)$ is defined on $[a, b]$. The definite integral of f from $x = a$ to $x = b$ is denoted by

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

and it represents the total signed area under the curve $y = f(x)$ between $x = a$ and $x = b$. Area under $f(x)$ and above the x -axis counts positively, and area above $f(x)$ and below the x -axis counts negatively. We call a and b the **bounds**, or limits, of integration.

Example 1:

Example 2:

Example 3:

Theorem: Properties of the Definite Integral:

1. $\int_a^a f(x)dx = 0.$
2. $\int_a^b f(x)dx + \int_b^c f(x)dx = \int_a^c f(x)dx.$
3. $\int_a^b f(x)dx = -\int_b^a f(x)dx.$
4. $\int_a^b (f(x) \pm g(x)) dx = \int_a^b f(x)dx \pm \int_a^b g(x)dx.$
5. $\int_a^b kf(x)dx = k \int_a^b f(x)dx.$

Example 4:

Example 5:

Example 6: