

# Definite Integrals

Integrals are a fundamental concept in calculus, which are used to calculate areas, volumes, and many other things. A definite integral calculates the net area between the function and the x-axis over a given interval.

## 1.1 Definition

The definite integral of a function  $f(x)$  over an interval  $[a, b]$  is defined as the limit of a Riemann sum:

$$\int_a^b f(x) \, dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i^*) \Delta x \quad (1.1)$$

where  $x_i^*$  is a sample point in the  $i^{\text{th}}$  subinterval of a partition of  $[a, b]$ ,  $\Delta x = \frac{b-a}{n}$  is the width of each subinterval, and the limit is taken as the number of subintervals  $n$  approaches infinity.

---

*This is a draft chapter from the Kontinua Project. Please see our website (<https://kontinua.org/>) for more details.*



# Answers to Exercises

