Chapter 1

Multiple Integrals

Recall the intuition behind integrals: we are chopping up a function's graph into little bits and summing the area of each of those bits. The same intuition can be applied to multiple integrals. Instead of our bits being slivers of the two-dimensional graph, we will instead have our bits be very skinny rectangular prisms of the three-dimensional graph.

1.1 Double Integrals

Definition 1.1.1 ▶ Double Integral

The **double integral** of f over a rectangle R is:

$$\iint\limits_{R} f(x,y)dA =$$

Theorem 1.1.2

If $f(x,y)$ is a continuous function defined on a rectangle $R := [a,b] \times [c,d]$, then the limit always exists, and

$$\iint\limits_{R} f(x,y)dA = \int_{c}^{d} \left(\int_{a}^{b} f(x,y)\, dx \right) dy$$