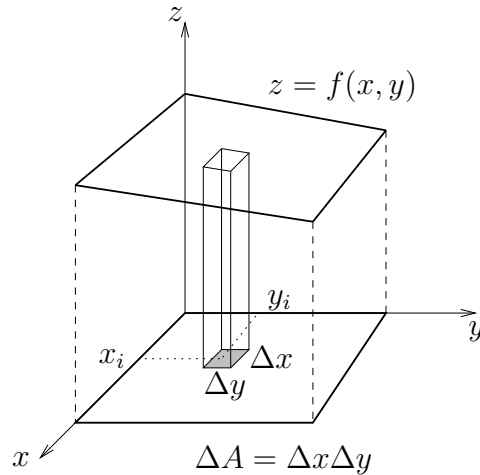


# Double Integrals

We can find the volume of a solid below a surface of equation  $z = f(x, y)$  and above a region  $R$  in the  $(x, y)$  plane by using a double integral which is defined by

$$\iint_R f(x, y) dA = \lim_{\Delta A \rightarrow 0} \sum_i f(x_i, y_i) \Delta A.$$



To compute double integrals we can use iterated integrals. For example, if the region of integration is defined by

$$R = \{(x, y) \mid a \leq x \leq b, c \leq y \leq d\}$$

we can compute the double integral either with

$$\iint_R f(x, y) dA = \int_a^b A(x) dx = \int_a^b \left( \int_c^d f(x, y) dy \right) dx$$

or with

$$\iint_R f(x, y) dA = \int_c^d A(y) dy = \int_c^d \left( \int_a^b f(x, y) dx \right) dy.$$

