15.1 Double Integrals Over Rectangles

Iterated Integrals

Fubini's Theorem allows us to switch the order of integration. For $a \leq x \leq b, c \leq y \leq d$,

$$\iint_R f(x,y)\,dA = \int_a^b \int_c^d f(x,y)\,dy\,dx = \int_c^d \int_c^d f(x,y)\,dx\,dy \tag{1}$$

15.2 Double Integrals Over General Regions

Integrals Between Curves

Type I Region lies between two functions of x, that is

$$a \leq x \leq b, \qquad g_1(x) \leq y \leq g_2(x)$$

Type II Region lies between two functions of y, that is

$$c \leq y \leq d, \qquad h_1(x) \leq x \leq h_2(x)$$

To solve these, make sure the function bounds are in the inner integral. See textbook for images.

Switching Order of Integration

Integrals can be switched as long as the region is the same. For example, the region defined by

$$0 \leq x \leq 4, \sqrt{x} \leq y \leq 2$$

is the same region as

$$0 \leq y \leq 2, 0 \leq x \leq y^2$$

Draw a picture!