15.5: Triple Integrals

Instead of integrating with two variables continuous over a plane, THREE variables!

Integration over a box

Given $f(x,y,z)$ continuous on box $B: a_x \leq x \leq b_x, a_y \leq y \leq b_y, a_z \leq z \leq b_z$

$$\iiint_B f(x,y,z)\,dV = \int_{a_z}^{b_z}\int_{a_y}^{b_y}\int_{a_x}^{b_x} f(x,y,z)\,dx\,dy\,dz$$

Fubini's Theorem applies here too.

Volume

$$V = \iiint_D dV$$

Average Value

The average value of a function F over region D in space is:

$$\text{Average Value of } F \text{ over } D = \frac{1}{\text{Volume of } D}\iiint_D F\,dV$$

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