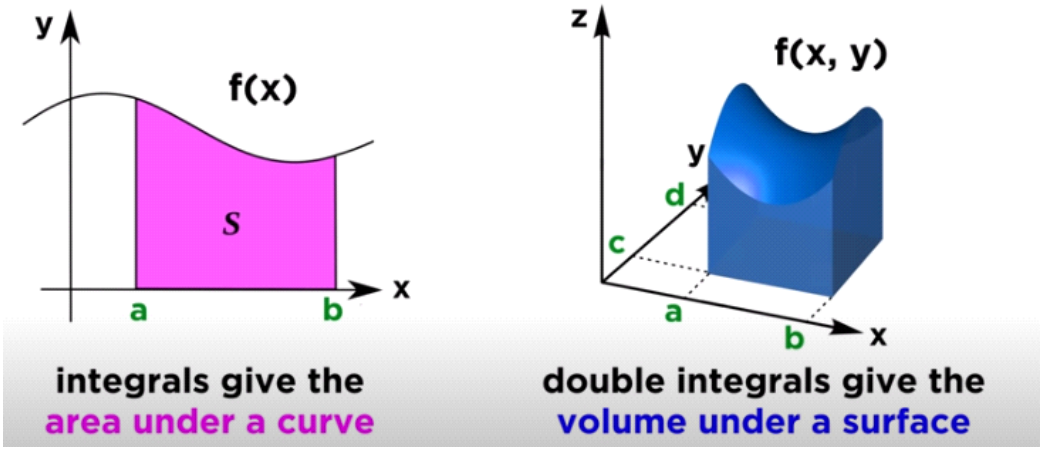
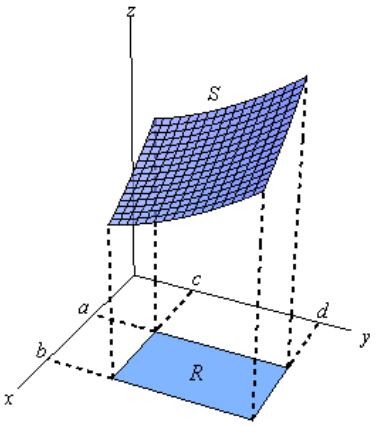
Double & Triple Integral Calculus I

Sunday, 30 June 2024 6:47 pm



Also, we will initially assume that $f(x,y) \geq 0$ although this doesn't really have to be the case. Let's start out with the graph of the surface S given by graphing $f(x,y)$ over the rectangle R.



$$\text{Volume} = \iint_R f(x,y)\, dA$$

Fubini's Theorem

If $f(x,y)$ is continuous on $R = [a,b] \times [c,d]$ then,

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

These integrals are called **iterated integrals**.

4. Compute the following double integrals.

a) $\int_0^3 \int_0^4 (4x + 3y)\, dx\, dy$ b) $\int_0^2 \int_0^3 (x^2 + y^2)\, dy\, dx$ c) $\int_0^1 \int_0^2 (x^2 y)\, dx\, dy$

d) $\int_0^1 \int_0^1 y\, e^{xy}\, dx\, dy$

5. Find the triple integrals of the function over the region W.

a) $f(x, y, z) = x^2 + 5y^2 - z$, W is the rectangular box $0 \leq x \leq 2, -1 \leq y \leq 1$, $2 \leq z \leq 3$.

b) $h(x, y, z) = ax + by + cz$, W is the rectangular box $0 \leq x \leq 1, 0 \leq y \leq 1$, $0 \leq z \leq 2$.

c) $f(x, y, z) = sin\, x\, cos(y + z)$, W is the cube $0 \leq x \leq \pi, 0 \leq y \leq \pi, 0 \leq z \leq \pi$.

d) $f(x, y, z) = e^{-x-y-z}$ W is the rectangular box with corners at $(0, 0, 0)$, $(a, 0, 0)$, $(0, b, 0)$, and $(0, 0, c)$.