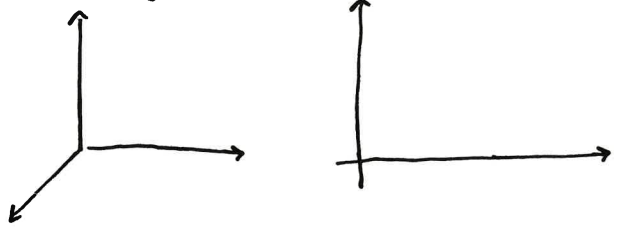
Section 16.7 - Surface Integrals of Functions

MVC

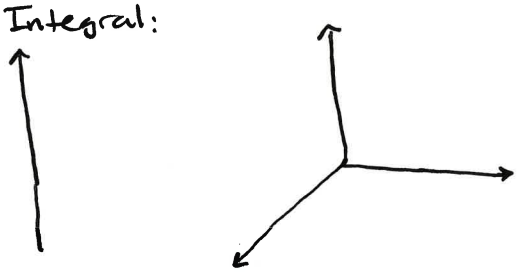
- Applications:
  1. Surface Area
  2. Surface Mass
  3. Center of Mass

- Idea:

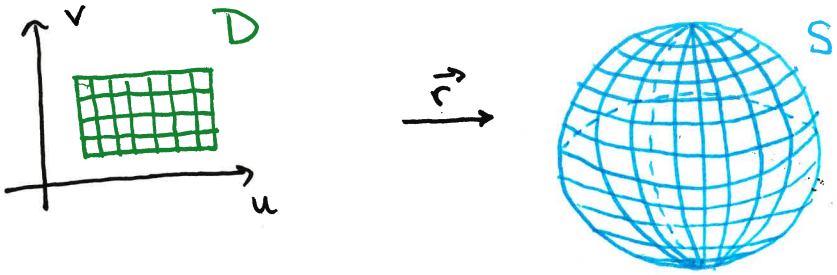
Line Integral:



Surface Integral:



Computing Surface Integrals: S parametrized by $\vec{r}(u,v) = \langle x, y, z \rangle$ for $(u,v) \in D$



Volume of rectangular Prism over S:

Surface Integral of f over S:

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Example Compute $\iint_S x^2 dS$ where S is the unit sphere.

- Application: Surface S a thin sheet with density ρ

  Mass of S: $m =$

  Center of mass of S: $(\bar{x}, \bar{y}, \bar{z}) =$

- Surface Integrals of graphs: S given by $z = g(x,y)$

  $\vec{r} =$

$$\iint_S f(x,y,z)\,dS =$$

Example Evaluate $\iint_S z\,dS$ where S is the surface whose sides S_1 is given by $x^2+y^2=1$, base S_2 is $x^2+y^2\leq 1$ in the plane $z=0$, and top S_3 is the plane $z=1+x$ above S_2.