Lecture 18

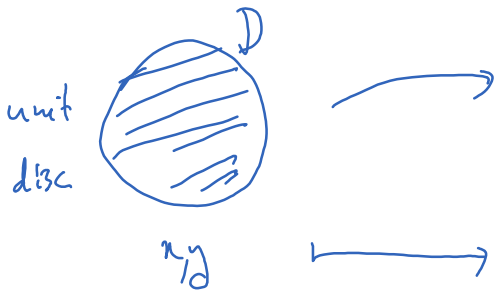
Tuesday, March 16, 2021 3:54 PM

* Prayer
* Spiritual thought
* Answering questions

The inverse law:

$$\frac{\partial(x,y)}{\partial(u,v)} = \left(\frac{\partial(u,v)}{\partial(x,y)}\right)^{-1}.$$

Ex:



vol = ?

$u = x^2$

$v = xy$

$$\left|\frac{\partial(u,v)}{\partial(x,y)}\right|$$

$$\iint_S du\,dv = \iint_D ?\; dx\,dy$$

$$\begin{vmatrix} 2x & 0 \\ y & x \end{vmatrix} = 2x^2$$

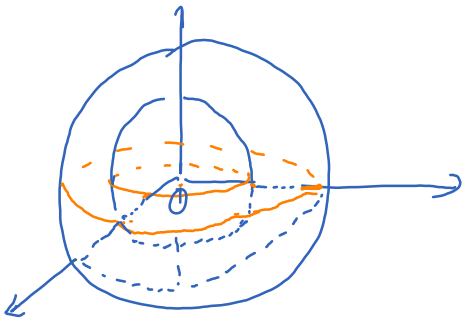
Ex:

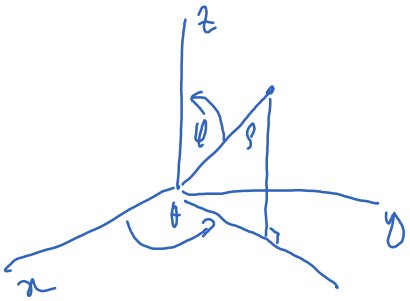
$$\begin{cases} \theta \le r \le \theta + 1 \\ 0 \le \theta \le \frac{\pi}{2} \end{cases}$$

$$\iint_D r\,\theta\,d\theta\,dr \stackrel{?}{=} \iint_{D'} ?\; dx\,dy$$

Spherical coords

$$\iiint_E x^2 \, dV$$





$$\begin{cases} x = \rho \sin\varphi \cos\theta \\ y = \rho \sin\varphi \sin\theta \\ z = \rho \cos\varphi \end{cases}$$

$$(x, y) = \underbrace{r(u, v)}_{\text{vector function}}$$

$$\underbrace{r(u+du, v) - r(u, v)}_{} = r_u \, du$$

$$\rho = \sqrt{x^2 + y^2 + z^2}$$

$$\cos\varphi = \frac{z}{\rho}$$

Ex: $(1, -\sqrt{3}, 2\sqrt{3})$