Lecture 28

Tuesday, June 11, 2024 1:10 AM

Finish the problem of evaluating

$$\iiint_E x\,dV$$

where E is the solid bounded between $x = 4y^2 + 4z^2$ and $x = 4$.

Cylindrical coords

2D: polar coords $\begin{cases} x = r\cos\theta \\ y = r\sin\theta \end{cases}$

3D: cylindrical coords $\begin{cases} x = r\cos\theta \\ y = r\sin\theta \\ z = z \end{cases}$

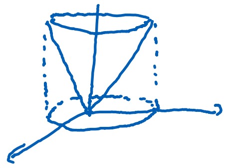
Cartesian coords: $(x, y, z) \in E$ (old domain)

Cylindrical coords: $(r, \theta, z) \in E'$ (new domain)

$$\iiint_E f(x,y,z)\,dV = \iiint_{E'} \bar{f}(r,\theta,z)\, r\,\underbrace{dr\,dz\,d\theta}_{\text{the order is "negotiable"}}$$

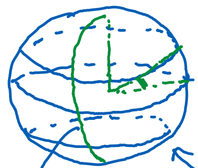
Ex Evaluate $\iiint_E zy^2\,dV$

where E is the solid bounded by the cone $z = \sqrt{x^2+y^2}$, the cylinder $x^2+y^2=4$ and the plane $z=0$.



We'll learn another change of variables, called the $\underbrace{\text{spherical coords}}$.

This has to do with GPS navigation on earth.



Lattitudes are full circles (determining climate)

Longitudes are only half circles (determining time)

Lattides are measured by the angle at the center, one side cutting through the equator. The equation is of lattitude 0°, the north pole is 90° North, the South pole is 90° South.

We will use spherical coords to help us evaluate triple integrals.