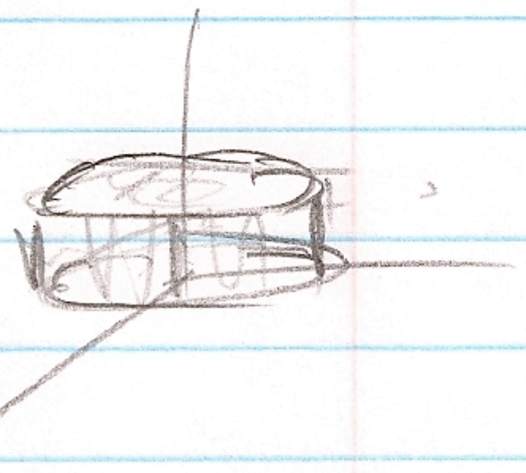
#5 Find $\iint_S F \cdot dS$

where $F = \langle x, y+z^3, e^\theta \rangle$ and

S is boundary of solid region E:

$0 \le x^2+y^2 \le 1, \quad 0 \le z \le 1$

S oriented outwards



use divergence thm

$\iint_S \vec{F} \cdot d\vec{S} = \iiint_E \operatorname{div} F \, dV$

$\nabla \operatorname{div} F = (+1) + 1 + 0 = 2$

$2\iiint_E dV$ convert → cylindrical!!

$2\int_0^{2\pi}\int_0^1\int_0^1 r \, dr\,dz\,d\theta = \frac{r^3}{2}$

$2\int_0^{2\pi}\int_0^1 \frac{1}{2}\, dz\,d\theta = \int_0^{2\pi} z\Big|_0^1 d\theta =$

2π

or just twice the volume of cylinder

$= 2\pi$