

Math 344

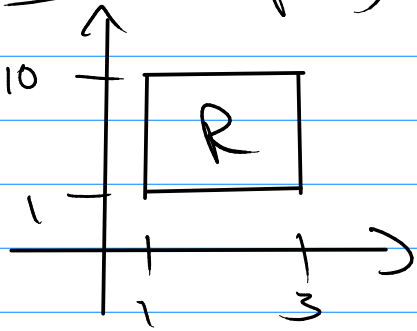
Exam over ch 12 Review

(10 probs (+) 1 extra credit)

ch 12 multiple integrals

$$\iint_R f \, dA, \quad \iiint_E f \, dV$$

12.13 (1 prob)



$$\iint_R f \, dA$$

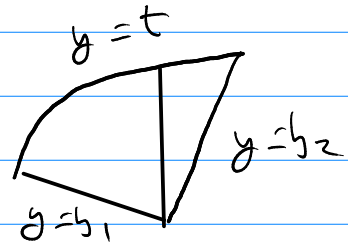
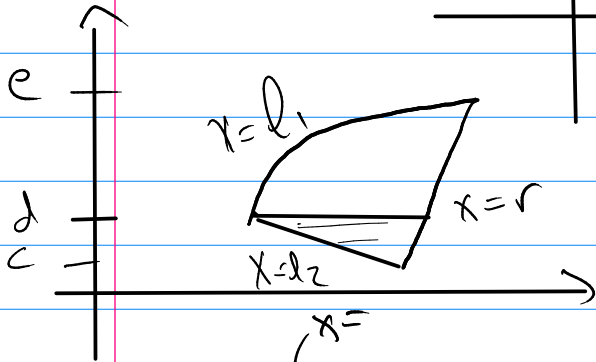
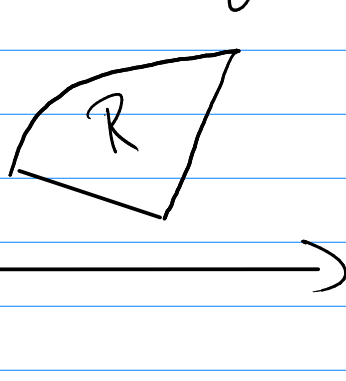
$$f(x) = x^2 \cdot y \sinh(y^2)$$

$$\int_1^{10} \left(\int_1^3 x^2 \cdot y \sinh(y^2) \, dx \right) dy$$

$$= \int_1^{10} y \sinh(y^2) \, dy \cdot \int_1^3 x^2 \, dx$$

Note: Know rules of integration
power, sum/diff, trig, sub., parts

12.2 $\iint_R f dA$ over general regions
(1 prob)

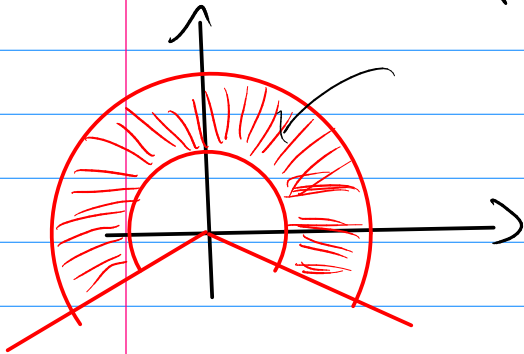


$$\int_{x=l_2}^{x=l_1} f dx$$

$$\int_{y=b_1}^{y=b_2} f dy$$

$$\int_{y=c}^{y=d} \left(\int_{x=l_2}^{x=l_1} f dx \right) dy + \int_{y=d}^{y=e} \left(\int_{x=l_1}^{x=r} f dx \right) dy$$

12.3 R is polar region (1 prob)



$$x = r \cos \theta$$

$$y = r \sin \theta$$

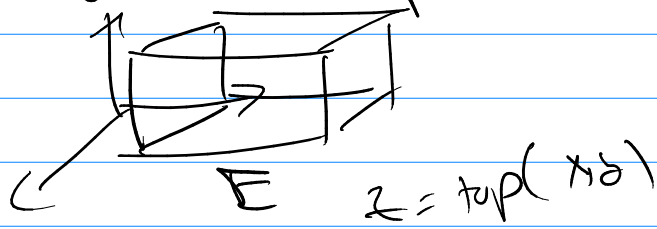
$$\iint_R f dA = \iint_{R_{\theta}} f(r, \theta) r dr d\theta$$

12.4 Apps (2 probs)

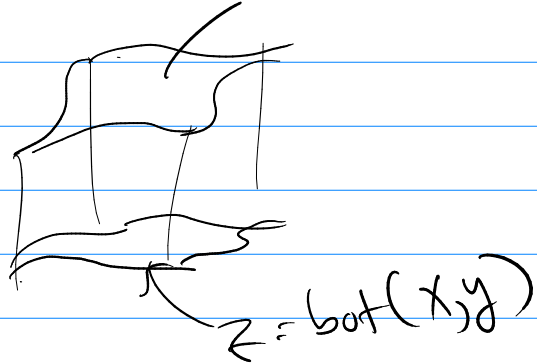
- ① Mass
- ② Moment to x or y-axis

12.5 Triple Integrals (2 probs)

- ① Box



- ② General



$$\iiint_E f \, dV = \iint_R \left(\int_{\text{bot}}^{\text{top}} f \, dz \right) dA$$

12.6 Cylindrical Coord. $\iiint_E f \, dV$ (1 prob)

$$\begin{aligned} x &= r \cos \theta \\ y &= r \sin \theta \\ z &= z \end{aligned}$$

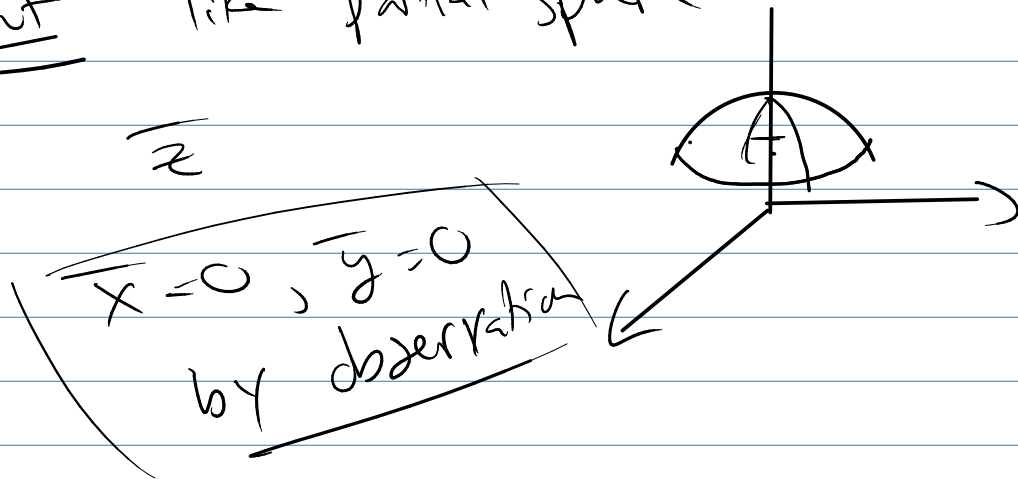
$$\iiint_{E(r, \theta, z)} f(r, \theta, z) \, r \, dr \, d\theta \, dz$$

(Given eq's) \rightarrow Setup \rightarrow Integrate

12.7 Spherical (1 prob)

→ center of mass (setup and solve)

but like partial sphere



12.8 Change in Variable (1 problem)

$$\iint_{R_{xy}} f \, dA = \iint_{R_{uv}} f \left(\left| \frac{\partial(x,y)}{\partial(u,v)} \right| \right) du \, dv$$

Set up

$$T: \begin{aligned} x &= x(u,v) \\ y &= y(u,v) \end{aligned}$$

ex. Credit

p. 720

#14

$R: y = \sqrt{1-x^2}, y = \sqrt{4-x^2}$ w/ x -axis

d inv. proportional to distance from origin

$\bar{x} = ?$ $\bar{y} = ?$ (center of mass)