Name: Laura Gross 

1. The integral $\int\int_R \sqrt{9-y^2}\, dA$, $R = [0,4]\times[0,3]$, represents the volume of a solid.

   (a) Sketch the solid, and describe it entirely (in a complete sentence). Be sure to label your sketch.

| 6 pts |
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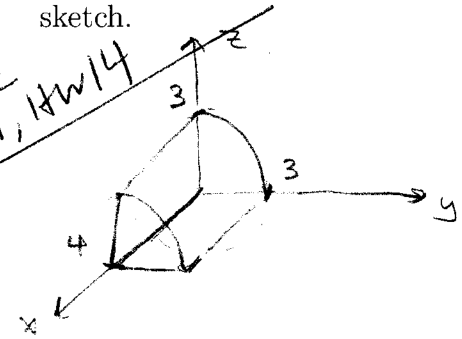
| |

like 16.1, HW14




It is $\frac{1}{4}$ of a circular cylinder.

like 16.1, 11-13

   (b) Evaluate the double integral USING GEOMETRY. **DO NOT DO ANY INTEGRATION.** Explain your geometric reasoning in one complete sentence. (You may check your answer with integration for partial credit.)

| 6 pts |
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Area of the cylinder is $\pi r^2 4$,

So $A = \frac{1}{4}[\pi 9 \cdot 4] = 9\pi$.

like Chap. Rev #41

2. Consider the integral $\int_0^3 \int_{-\sqrt{9-x^2}}^{\cancel{\sqrt{9-x^2}}\ 0} (x^2+y^2)^{3/2}\, dy\, dx$. Sketch the region of integration, and convert the integral to polar coordinates: **Do not evaluate the integral.**

| 13 pts |
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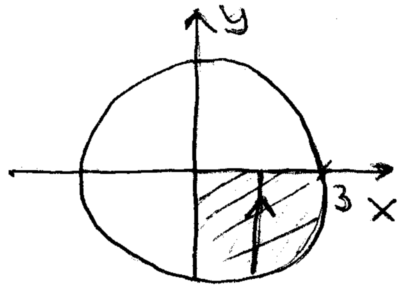



$$\int_{-\pi/2}^{0} \int_0^3 (r^2)^{3/2}\, r\, dr\, d\theta$$

(OVER)

Chap Rev #3

3. Calculate $\int_1^2 \int_0^2 (y + 2xe^y)\, dx\, dy$.

13 pts

$$= \int_1^2 [yx + x^2 e^y] \Big|_{x=0}^{x=2} dy$$

$$= \int_1^2 [2y + 4e^y]\, dy$$

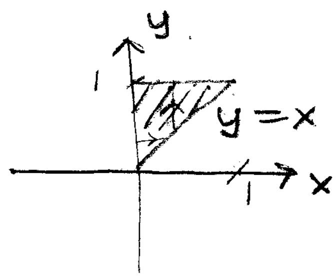
$$= y^2 + 4e^y \Big|_{y=1}^{2}$$

$$= 4 + 4e^2 - 1 - 4e$$

$$( = 3 + 4e(e-1))$$

Chap Rev #13

4. Calculate $\int_0^1 \int_x^1 \cos(y^2)\, dy\, dx$.




12 pts

$$= \int_0^1 \int_0^y \cos(y^2)\, dx\, dy$$

$$= \int_0^1 x \cos(y^2) \Big|_{x=0}^{y} dy = \int_0^1 y \cos(y^2)\, dy$$

$$= \frac{\sin(y^2)}{2} \Big|_0^1$$

$$= \frac{1}{2} \sin(1)$$

Chap Rev #39

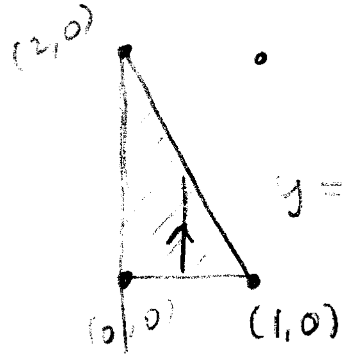
5. Set up **but do not evaluate** an integral for the AREA of the of the part of the surface $z = x^2 + y$ that lies above the triangle with vertices $(0,0)$, $(1,0)$, and $(0,2)$.

13 pts

$f(x,y) = x^2 + y$

$f_x = 2x \;,\; f_y = 1$

$\sqrt{f_x^2 + f_y^2 + 1} = \sqrt{(2x)^2 + 1^2 + 1}$




$$\int_0^1 \int_0^{2-2x} \sqrt{4x^2+2}\; dy\, dx$$

Chap Rev. #42

6. Consider the integral $\int_{-2}^{2}\int_{0}^{\sqrt{4-y^2}}\int_{-\sqrt{4-x^2-y^2}}^{\sqrt{4-x^2-y^2}} y^2\sqrt{x^2+y^2+z^2}\,dz\,dx\,dy$. Sketch the region of integration (or describe it geometrically in one complete sentence), and convert the integral to spherical coordinates. **Do not evaluate the integral.**

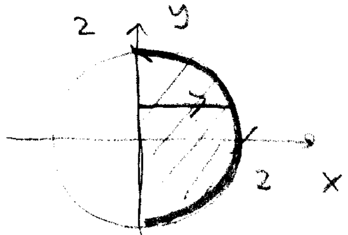
12 pts

$z = \pm\sqrt{4 - x^2 - y^2}$ $\qquad z^2 = 4 - x^2 - y^2$

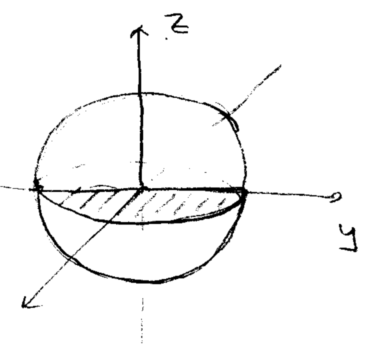
$x^2 + y^2 + z^2 = 4$

top & bottom of sphere $\rho = 2$.

$x = \sqrt{4 - y^2}$ $\qquad x^2 = 4 - y^2 \longrightarrow x^2 + y^2 = 4 \;,\; x \geq 0$.




Region of integration is half of a solid sphere: front half in this view.




$$\int_0^{\pi}\int_{-\pi/2}^{\pi/2}\int_0^{2} (\rho\sin\phi\sin\theta)^2\,\rho\cdot\rho^2\sin\phi\, d\rho\, d\theta\, d\phi$$

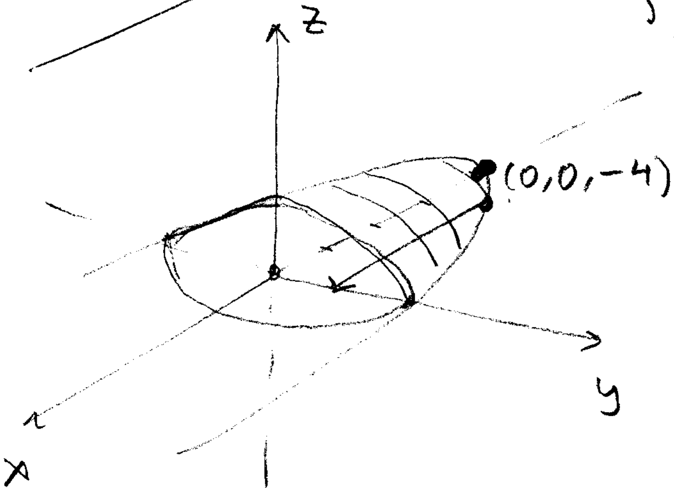
(OVER)

Name: Laura Gross. 

like Chap Rev #25

7. Calculate $\iiint_E z\, dV$, where $E$ is bounded by the paraboloid $x = y^2 + z^2 - 4$ and the plane $x = 0$.

13 pts




$$\iint_D \int_{y^2+z^2-4}^{0} z \, dx\, dA$$

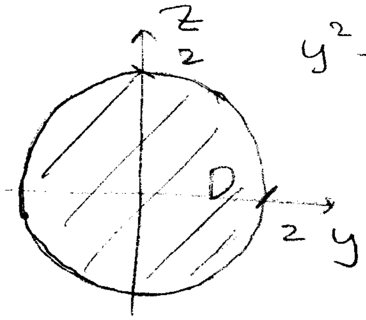
$$= \iint_D z\, x \Big|_{x=y^2+z^2-4}^{0} dA$$

$$= \iint_D -z\,(+y^2+z^2-4)\, dA$$

$$= \int_0^{2\pi}\int_0^{2} -r\sin\theta\,(r^2-4)\, r\, dr\, d\theta.$$

$$= +\left[\frac{r^5}{5} - \frac{4r^3}{3}\right] \cos\theta \Big|_0^{2\pi}$$

$$= 0.$$




$y^2+z^2-4=0.$

$y = r\cos\theta$

$z = r\sin\theta$

8. Sketch the vector field $\mathbf{F} = x\mathbf{j}$. You may like to support your work with a table of values.

12 pts

like 17.1 HW 1-6