Name______________________ ID____________ Section______

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MATH 253 Honors EXAM 2 Fall 1999

Sections 201-202 P. Yasskin

Multiple Choice: (10 points each)

1. Compute $\int_0^2 \int_y^2 (x+y)\,dx\,dy$.

a. 2
b. 4
c. 6
d. 8
e. 10

2. Compute $\iiint_R 2xy\,dV$ over the solid region R given by $x^2 \le y \le x$ and $0 \le z \le x$.

a. $\frac{1}{70}$
b. $\frac{1}{35}$
c. $\frac{2}{35}$
d. $\frac{4}{35}$
e. None of these.

3. Compute $\iint_R e^{x^2+y^2}\,dA$ over the region R in the 1^{st} quadrant between the circles $x^2+y^2=4$ and $x^2+y^2=9$.

a. $\frac{\pi}{2}e^5$

b. $\frac{\pi}{4}(e^3-e^2)$

c. $\frac{\pi}{2}(e^3-e^2)$

d. $\frac{\pi}{4}(e^9-e^4)$

e. $\frac{\pi}{2}(e^9-e^4)$

4. Compute $\int_0^2\int_y^2 e^{-x^2}\,dx\,dy$.

a. $\frac{1}{2}(1-e^{-4})$

b. $\frac{1}{4}(1-e^{-4})$

c. $\frac{1}{4}(e^{-4}-1)$

d. $\frac{1}{4}e^{-4}$

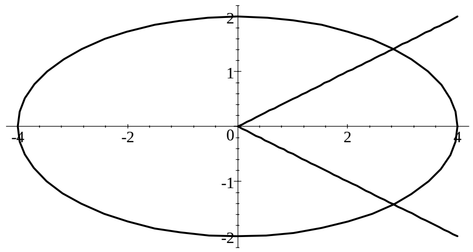
e. $-\frac{1}{2}e^{-4}$

5. A cupcake has its base on the xy-plane. Its sides are the cylinder $x^2 + y^2 = 4$ and its top is the paraboloid $z = 6 - x^2 - y^2$. Its density is $\rho = 3\ \frac{\text{gm}}{\text{cm}^3}$. Find its total mass and the z-component of its center of mass.

6. Find the mass and the z-component of the center of mass of the hemisphere $0 \le z \le \sqrt{25 - x^2 - y^2}$ whose density is given by $\delta = \frac{1}{5}(x^2 + y^2 + z^2)$.

7. A cardboard box is constructed with a hinge at the back so that the top, bottom and back have one sheet of cardboard while the sides and front have two sheets of cardboard. If the volume is $3\ \text{ft}^3$, find the dimensions of the box which minimize the amount of cardboard needed.

8. Compute $\iint_R x\,dx\,dy$ over the region inside the ellipse $\frac{x^2}{16} + \frac{y^2}{4} = 1$ between the lines $y = \frac{x}{2}$ and $y = -\frac{x}{2}$ in the 1^{st} and 4^{th} quadrants.



HINT: Use the elliptic coordinate system:

$$x = 4t\cos\theta \qquad y = 2t\sin\theta$$