

Name _____

MATH 251 Exam 3 Version H Fall 2017

Sections 515 P. Yasskin

Multiple Choice: (6 points each. No part credit.)

1-10	/60	15	/15
14	/15	16	/15
		Total	/105

1. Compute $\int_0^2 \int_{x^2}^{2x} 2y \, dy \, dx$.

- a. $-\frac{56}{15}$
- b. $-\frac{32}{15}$
- c. $\frac{32}{15}$
- d. $\frac{64}{15}$
- e. $\frac{128}{15}$

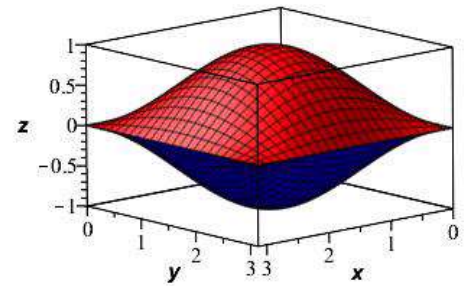
2. Find the average value of the function $f(x,y) = x^2 \sin y$ on the rectangle $[0,3] \times [0,\pi]$.

- a. $\frac{18}{\pi}$
- b. $\frac{6}{\pi}$
- c. 3π
- d. 18
- e. 54π

3. Find the volume of the ravioli bounded by

$$-\sin x \sin y \leq z \leq \sin x \sin y$$

for $0 \leq x \leq \pi$ and $0 \leq y \leq \pi$.



- a. 2
- b. 4
- c. 8
- d. π^2
- e. $4\pi^2$

4. Find the mass of a triangular plate with vertices $(0,0)$, $(2,4)$ and $(2,-4)$ whose surface mass density is $\delta = x$.

- a. $\frac{32}{3}$
- b. $\frac{32}{5}$
- c. $\frac{16}{3}$
- d. $\frac{16}{5}$
- e. $\frac{8}{3}$

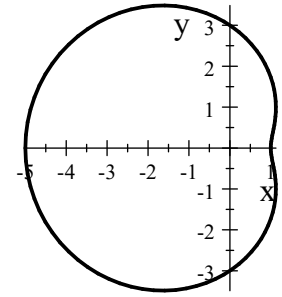
5. Find the center of mass of a triangular plate with vertices $(0,0)$, $(2,4)$ and $(2,-4)$ whose surface mass density is $\delta = x$.

- a. $(\frac{2}{3}, 0)$
- b. $(0, \frac{2}{3})$
- c. $(\frac{3}{2}, 0)$
- d. $(0, \frac{3}{2})$
- e. $(16, 0)$

6. Find the area inside the limaçon

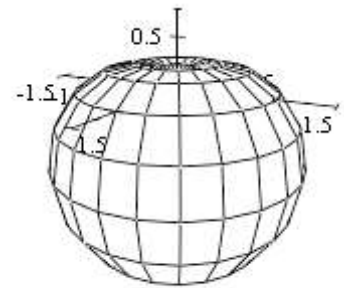
$$r = 3 - 2 \cos \theta.$$

- a. π
- b. 3π
- c. 7π
- d. 9π
- e. 11π



7. Find the volume of the apple whose surface is given in spherical coordinates by $\rho = 1 - \cos \varphi$.

- a. 2π
- b. 4π
- c. $\frac{2\pi}{3}$
- d. $\frac{8\pi}{3}$
- e. $\frac{16\pi}{3}$



8. Find the normal to the parametric surface $\vec{R}(u, v) = (u + v, u - v, uv)$

- a. $(u + v, v - u, -2)$
- b. $(u + v, u - v, -2)$
- c. $(u + v, v - u, 2)$
- d. $(u + v, u - v, 2)$
- e. $(2, 0, u + v)$

9. Find the mass of the half cylinder **surface** $x^2 + y^2 = 4$ for $y \geq 0$ and $0 \leq z \leq 3$, with surface mass density $\delta = y$. Parametrize the surface as

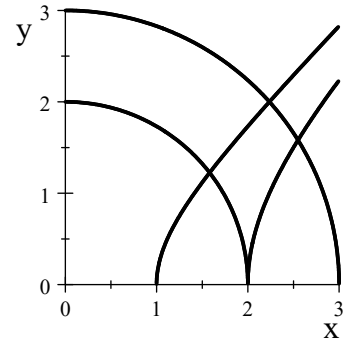
$$\vec{R}(\theta, z) = (2 \cos \theta, 2 \sin \theta, z)$$

- a. 0
 - b. 24
 - c. 48
 - d. 72
 - e. 96
10. Compute the flux $\iint \vec{F} \cdot d\vec{S}$ of the vector field $\vec{F} = (xy, y^2, yz)$ through the half cylinder $x^2 + y^2 = 4$ for $y \geq 0$ and $0 \leq z \leq 3$ oriented toward the positive y -axis.

- a. 0
- b. 24
- c. 48
- d. 72
- e. 96

Work Out: (15 points each. Part credit possible. Show all work.)

11. (15 points) Compute the integral $\iint xy dA$ over the diamond shaped region in the 1st quadrant bounded by $x^2 + y^2 = 4$, $x^2 + y^2 = 9$, $x^2 - y^2 = 1$, and $x^2 - y^2 = 4$.



12. (15 points) Find the mass of the ice cream cone below the paraboloid $z = 8 - x^2 - y^2$ above the cone $z = 2\sqrt{x^2 + y^2}$ if the density is $\delta = \sqrt{x^2 + y^2}$.



13. (15 points) Find the centroid of the hemisphere $0 \leq z \leq \sqrt{9 - x^2 - y^2}$.

