Name________________________

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

MATH 251 Exam 3 Version A Fall 2017

Sections 515 P. Yasskin

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

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

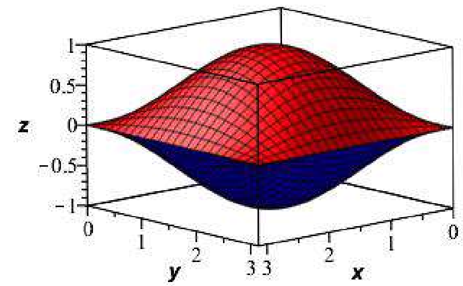
d. 18

e. 54π

3. Find the volume of the ravioli bounded by

$$-\sin x \sin y \le z \le \sin x \sin y$$

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



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. $\left(\frac{2}{3},0\right)$

b. $\left(0,\frac{2}{3}\right)$

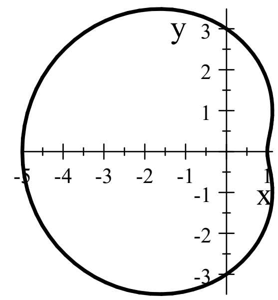
c. $\left(\frac{3}{2},0\right)$

d. $\left(0,\frac{3}{2}\right)$

e. $(16,0)$

6. Find the area inside the limacon

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



a. π

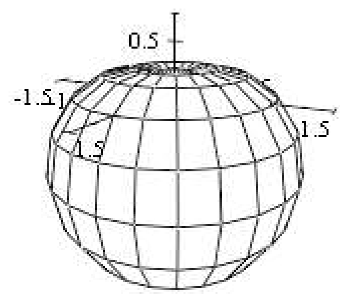
b. 3π

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

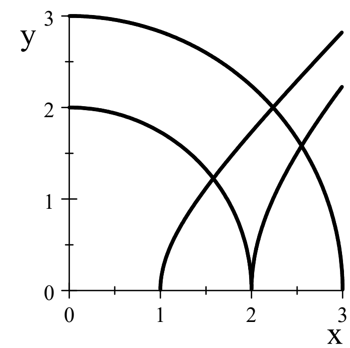
c. 48

d. 72

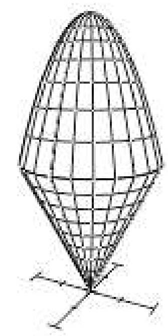
e. 96

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

$$0 \le z \le \sqrt{9 - x^2 - y^2}.$$