1-8	/48
9	/12
10	/20
11	/20
Total	/100

Name________________________

MATH 221 Exam 2 Fall 2012

Sections 503 P. Yasskin

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

1. Compute $\int_0^2 \int_x^2 5y^3 \, dy \, dx$.

a. 68

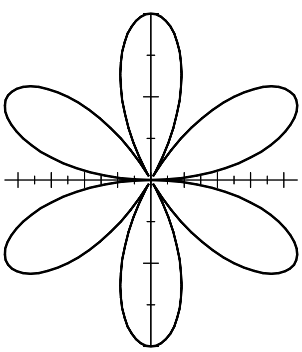
b. 48

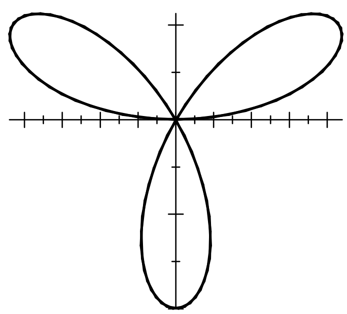
c. 32

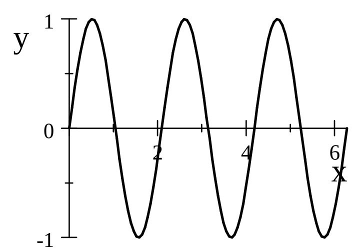
d. 27

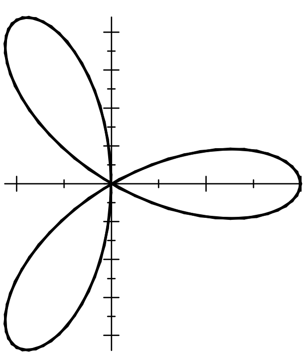
e. 15

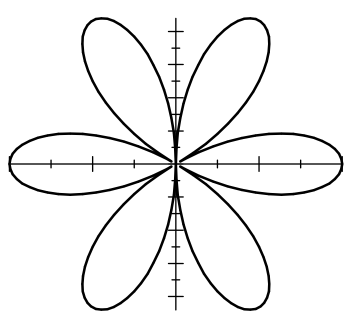
2. Which of the following is the polar plot of $r = \sin(3\theta)$?

a. 

b. 

c. 

d. 

e. 

3. Find the mass of a triangular plate whose vertices are $(0,0)$, $(1,0)$ and $(1,3)$, if the density is $\rho = 2y$.

a. 1

b. 2

c. 3

d. 4

e. 5

4. Find the y-component of the center of mass of a triangular plate whose vertices are $(0,0)$, $(1,0)$ and $(1,3)$, if the density is $\rho = 2y$.

a. $\frac{9}{2}$

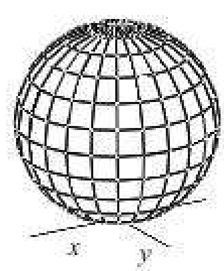
b. $\frac{7}{2}$

c. $\frac{5}{2}$

d. $\frac{3}{2}$

e. $\frac{1}{2}$

5. In spherical coordinates $\rho = 2\cos\varphi$ is a sphere of radius 1 centered at $(0,0,1)$. If its volume density is $\delta = x^2 + y^2 + z^2$ then its mass is given by the integral:



a. $M = \int_0^{2\pi} \int_0^{\pi/2} \int_0^{\pi} \rho^2 2\cos\varphi \sin\varphi \, d\rho \, d\varphi \, d\theta$

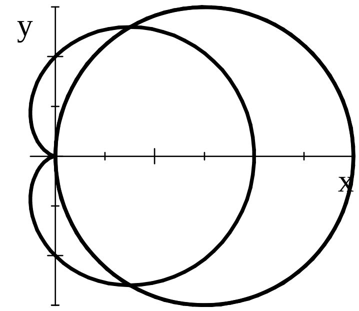
b. $M = \int_0^{2\pi} \int_0^{\pi} \int_0^{2\cos\varphi} \rho^4 \sin\varphi \, d\rho \, d\varphi \, d\theta$

c. $M = \int_0^{2\pi} \int_0^{\pi/2} \int_0^{2\cos\varphi} \rho^2 \sin\varphi \, d\rho \, d\varphi \, d\theta$

d. $M = \int_0^{2\pi} \int_0^{\pi} \int_0^{2\cos\varphi} \rho^2 \sin\varphi \, d\rho \, d\varphi \, d\theta$

e. $M = \int_0^{2\pi} \int_0^{\pi/2} \int_0^{2\cos\varphi} \rho^4 \sin\varphi \, d\rho \, d\varphi \, d\theta$

6. Find the area inside the circle $r = 3\cos\theta$ and outside the cardioid $r = 1 + \cos\theta$.



a. $\dfrac{\pi}{4}$

b. $\dfrac{\pi}{2}$

c. π

d. $\dfrac{3\pi}{2}$

e. 2π

7. Parabolic coordinates are given by $u = y - x^2$ and $v = y + x^2$ where $v > u$. So the area element is $dA = dx\,dy =$

a. $\dfrac{1}{2\sqrt{2}\,\sqrt{v-u}}\,du\,dv$

b. $\dfrac{-1}{2\sqrt{2}\,\sqrt{v-u}}\,du\,dv$

c. $\dfrac{1}{4\sqrt{2}\,\sqrt{v-u}}\,du\,dv$

d. $\dfrac{-1}{4\sqrt{2}\,\sqrt{v-u}}\,du\,dv$

e. $\dfrac{1}{8\sqrt{2}\,\sqrt{v-u}}\,du\,dv$

8. If $f = xe^{yz} - ye^{xz}$, then $\vec{\nabla} \times \vec{\nabla} f =$

a. $(2xe^{yz} - 2xe^{xz} + 2xyze^{yz}, 0, 2ze^{xz} - 2ze^{yz})$
b. $(2xe^{yz} + 2xe^{xz} + 2xyze^{yz}, 0, 2ze^{xz} + 2ze^{yz})$
c. $(e^{yz} - yze^{xz}, -xze^{yz} + e^{xz}, xye^{yz} - xye^{xz})$
d. $(e^{yz} - yze^{xz}, xze^{yz} - e^{xz}, xye^{yz} - xye^{xz})$
e. $\vec{0}$

Work Out: (Points indicated. Part credit possible. Show all work.)

9. (12 points) Determine whether or not each of these limits exists. If it exists, find its value.

a. $\lim_{(x,y)\to(0,0)} \dfrac{3x^2y^2}{x^6 + 3y^3}$

b. $\lim_{(x,y)\to(0,0)} \dfrac{xy^2}{x^2 + y^2}$

10. (20 points) Compute $\iint \vec{\nabla} \times \vec{F} \cdot d\vec{S}$ for the vector field $\vec{F} = (yz, -xz, z^2)$ over the paraboloid $z = 9 - x^2 - y^2$ for $z \geq 5$ oriented down and in.

Note: The paraboloid may be parametrized as $\vec{R}(r, \theta) = (r\cos\theta, r\sin\theta, 9 - r^2)$.

11. (20 points) Compute $\iiint \vec{\nabla} \cdot \vec{F}\, dV$ for the vector field $\vec{F} = (x^3, y^3, x^2 z + y^2 z)$ over the solid region below the cone $z = 9 - \sqrt{x^2 + y^2}$ and above the plane $z = 5$.