NDU

MAT 224

Calculus IV

Exam # 2

Thursday May 29, 2014

Duration: 60 minutes

Name: ______________________

Section: ____________________

Grade: ____________________

Problem Number	Points	Score
1	40	
2	13	
3	18	
4	32	
Total	103	

1) **(40 points)** For each of the following multiple-choice questions, circle the **letter** of the correct answer. If more than one letter is circled in the same problem, you will receive no credit for that problem.

Question A **(8 points)** Using the method of Lagrange Multipliers to find the point closest to the origin on the curve of intersection of the plane $x + y + z = 1$ and the cone $z^2 = 2x^2 + 2y^2$, can yield the system of equations:

a) $2x = \lambda + 4\mu x$
$2y = \lambda + 4\mu y$
$2z = \lambda$
$x + y + z - 1 = 0$
$2x^2 + 2y^2 - z^2 = 0$

b) $2x = 4\mu x$
$2y = 4\mu y$
$2z = \lambda$
$x + y + z - 1 = 0$
$2x^2 + 2y^2 - z^2 = 0$

c) $2x = \lambda + 4\mu x$
$2y = \lambda + 4\mu y$
$2z = \lambda - 2\mu z$
$x + y + z = 0$
$2x^2 + 2y^2 = 0$

d) $2x = \lambda + 4\mu x$
$2y = \lambda + 4\mu y$
$2z = \lambda - 2\mu z$
$x + y + z - 1 = 0$
$2x^2 + 2y^2 - z^2 = 0$

e) If none of the above is correct, circle (**e**) and write your answer here:

Question B **(8 points)**

$$\int_0^9 \int_{\sqrt{y}}^3 3\sec^2(x^3)\,dx\,dy =$$

a) $\tan(27)$
b) $\tan(8)$
c) $\tan(1)$
d) 0
e) If none of the above is correct, circle (**e**) and write your answer here:

Question C **(8 points)**

Let R be the region in the first quadrant of the xy-plane that lies outside the circle $x^2 + y^2 = 1$ and inside the circle $x^2 + y^2 = 9$. Then $\iint_R (x + y)\,dx\,dy =$

a) $\dfrac{2}{3}$
b) $\dfrac{52}{3}$
c) $\dfrac{54}{3}$
d) 0
e) If none of the above is correct, circle (**e**) and write your answer here:

Question D **(16 points)** Consider the region D in space that is bounded from below by the xy-plane, from above by the paraboloid $z = x^2 + y^2$ and laterally by the cylinder $x^2 + y^2 = 4$. Then a triple integral, in cylindrical coordinates, representing the volume of D is:

Part 1 According to the order of integration $dzdrd\theta$

a) $\int_0^{2\pi}\int_0^2\int_{r^2}^4 r\,dz\,dr\,d\theta$

b) $\int_0^{2\pi}\int_0^2\int_0^{x^2+y^2} r\,dz\,dr\,d\theta$

c) $\int_0^{2\pi}\int_0^2\int_0^{r^2} r\,dz\,dr\,d\theta$

d) $\int_0^{\pi}\int_0^4\int_0^{r^2} r\,dz\,dr\,d\theta$

e) If none of the above is correct, circle (**e**) and write your answer here:

Part 2 According to the order of integration $drdzd\theta$

a) $\int_0^{2\pi}\int_0^4\int_0^{\sqrt{z}} r\,dr\,dz\,d\theta$

b) $\int_0^{2\pi}\int_0^4\int_{r^2}^2 r\,dr\,dz\,d\theta$

c) $\int_0^{2\pi}\int_0^2\int_{\sqrt{z}}^4 r\,dr\,dz\,d\theta$

d) $\int_0^{2\pi}\int_0^{r^2}\int_0^2 r\,dr\,dz\,d\theta$

e) If none of the above is correct, circle (**e**) and write your answer here:

2) **(13 points)** Let R be the region in the first quadrant bounded by the curves $y = 0$ and $(x-2)^2 + y^2 = 4$, with $0 \le x \le 2$.

a) **(3 points)** Draw the region R in the xy-plane.

b) **(10 points)** Set up a double integral in polar coordinates using the order of integration $dr\,d\theta$ equal to $\iint_R f(x,y)\,dA$, where $f(x,y) = x^4 + y^3$.

3) (18 points) Let D represent the region in the first octant bounded by the coordinate planes and the planes $3x + z = 6$ and $y + z = 6$. Set up triple integrals in rectangular coordinates representing the volume of D according to each of the following orders:

a) (8 points) $dy\,dx\,dz$

b) (10 points) $dz\,dy\,dx$

4) (32 points) Let D be the solid region in space bounded **from below** by the plane $z = 3$ and **from above** by the sphere $x^2 + y^2 + (z-2)^2 = 4$.

a) (4 points) Draw the region D.

b) (5 points) Rewrite each of the above equations using spherical coordinates.

c) (10 points)) Set up triple integrals in spherical coordinates for the volume of D using the order of integration $d\rho d\phi d\theta$.

d) (13 points)) Set up triple integrals in spherical coordinates for the volume of D using the order of integration $d\varphi d\rho d\theta$.