NDU

MAT 224

Calculus IV

Spring 2016, Exam # 2

Monday May 16, 2016

Duration: 60 minutes

Name: _____

Section: _____

Grade: _____

You have 6 pages and 4 problems

Phones are forbidden.

1) **(32 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 **(16 points)** Use the method of Lagrange Multipliers to find the maximum value or the minimum value of the function $f(x,y) = x^2 + y^2 - 5$ subject to the constraint $x^2 + y^2 - 2x - 4y = 0$.

Part I (8 points): The Lagrange method yields to the system of equations:

a) $x = \lambda(x-1)$
$y = \lambda(y+2)$
$x^2 + y^2 = 2x + 4y$

b) $x = \lambda(x-1)$
$y = \lambda(y-2)$
$x^2 + y^2 = 2x + 4y$

c) $x = \lambda(x+1)$
$y = \lambda(y-2)$
$x^2 + y^2 = 2x + 4y$

d) $x = \lambda(x+1)$
$y = \lambda(y+2)$
$x^2 + y^2 = 2x + 4y$

Part II (8 points): The **maximum** value is:

a) 0
b) -5
c) 15
d) 20

Question B **(8 points)**

$$\int_{-2}^{0}\int_{0}^{\sqrt{1-(x+1)^2}} \frac{xy}{2(x^2+y^2)}\,dydx =$$

a) $-\frac{1}{4}$

b) $\frac{1}{4}$

c) $\frac{1}{2}$

d) $-\frac{1}{2}$

Question C **(8 points)**

The value of $\int_{-1}^{1}\int_{x^2}^{1} \frac{\sec^2 y}{\sqrt{y}}\,dydx$ is:

a) tan 1

b) -2 tan 1

c) - tan 1

d) 2 tan 1

2) **(22 points)** We consider the following double integral $\int_0^{\sqrt{3}} \int_0^{\sqrt{4-x^2}} x\sqrt{x^2+y^2}\,dy\,dx$

a) **(12 points) Set up** an equivalent integral using the order of integration $dxdy$. **(Do not evaluate).**

b) **(10 points) Set up** to an equivalent polar integral using the order of integration $drd\theta$. **(Do not evaluate).**

(21 points) Let D be the tetrahedron cut from the first octant by the plane $x + y + z = 2$.

a) **(5 points)** Draw D.

b) **(8 points)** **Set up** triple integrals in rectangular coordinates representing the volume of D according to the order of integration $dy\,dx\,dz$.

c) **(8 points)** **Set up** triple integrals in rectangular coordinates representing the volume of D according to the order of integration $dx\,dz\,dy$.

3) **(27 points)** Let D be the solid region bounded from below by the surface $z = x^2 + y^2$, on the sides by $x^2 + y^2 = 1$ and from above by $z = 4$.

a) **(5 points)** Draw the region D**.**

b) **(8 points)** Find the volume of D using cylindrical coordinates and the order of integration $dz\,\mathrm{d}r\,\mathrm{d}\theta$

c) **(14 points) Set up** triple integrals in cylindrical coordinates representing the volume of D according to the order of integration $dr\,\mathrm{d}z\,\mathrm{d}\theta$.