NDU

MAT 224

Calculus IV

Exam # 2

December 7, 2016

Duration: 60 minutes

Name: _____

Section: _____

Instructor: _____

Grade: _____

Problem Number	Points	Score
1	40	
2	17	
3	29	
4	20	
Total	106	

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 : $\int_{-1}^{1} \int_{0}^{\sqrt{1-y^2}} e^{2x^2+2y^2}\, dxdy =$

a) $\frac{\pi}{2}(e^2-1)$

b) $\frac{\pi}{4}(e^2-1)$

c) $\frac{\pi}{8}(e^2-1)$

d) $\frac{\pi}{16}(e^2-1)$

Question B: $\int_{0}^{4} \int_{\sqrt{y}}^{2} \cos(x^3+1)\, dxdy =$

a) $\frac{\sin(1)-\sin(9)}{3}$

b) $\sin(9)-\sin 1$

c) $\frac{\sin(9)-\sin(1)}{3}$

d) $\sin(1)-\sin(9)$

Question C: The value of the integral $\int_0^1 \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \int_{-(x^2+y^2)}^{(x^2+y^2)} 21xy^2\,dz\,dy\,dx$ is:

a) 4
b) -4
c) 2
d) -2

Question D:

The volume of the region cut from the first octant by the plane $2x+y+z=4$ can be calculated using the integral:

a) $\int_0^4 \int_0^{4-z} \int_0^{4-2x-z} dydxdz$

b) $\int_0^4 \int_0^{2-y/2} \int_0^{4-2x-y} dydxdz$

c) $\int_0^4 \int_0^2 \int_0^{2-z/2-x} dydxdz$

d) $\int_0^4 \int_0^{2-z/2} \int_0^{4-z-2x} dydxdz$

Question E:

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)
$$\begin{aligned} 2x &= \lambda + 4\mu x \\ 2y &= \lambda + 4\mu y \\ 2z &= \lambda - 2\mu z \\ x+y+z-1 &= 0 \\ 2x^2+2y^2-z^2 &= 0 \end{aligned}$$

b)
$$\begin{aligned} 2x &= \lambda + 4\mu x \\ 2y &= \lambda + 4\mu y \\ 2z &= \lambda \\ x+y+z-1 &= 0 \\ 2x^2+2y^2-z^2 &= 0 \end{aligned}$$

c)
$$\begin{aligned} 2x &= \lambda + 4\mu x \\ 2y &= \lambda + 4\mu y \\ 2z &= \lambda - 2\mu z \\ x+y+z &= 0 \\ 2x^2+2y^2 &= 0 \end{aligned}$$

d)
$$\begin{aligned} 2x &= 4\mu x \\ 2y &= 4\mu y \\ 2z &= \lambda \\ x+y+z-1 &= 0 \\ 2x^2+2y^2-z^2 &= 0 \end{aligned}$$

2) (17 points) Find all local extreme values and saddle points of the function $f(x,y) = x^4 - 8x^2 + 3y^2 - 6y$.

3) (29 points) Consider the solid region D that lies inside the cylinder $x^2 + y^2 = 1$, bounded from below by the paraboloid $z = 1 - x^2 - y^2$ and from above by the plane $z = 4$.

a) (4 points) Draw the region D.

b) (25 points) Set up triple integrals representing the volume of the region D:

i) (10 points) In cylindrical coordinates with the order of integration $dz\, dr\, d\theta$.

ii) (15 points) In cylindrical coordinates with the order of integration $dr\ dz\ d\theta$.

4) (20 points) Let D be the region bounded below by the *xy*-plane, on the sides by the sphere $x^2 + y^2 + z^2 = 4$, and above by the cone $z = \sqrt{x^2 + y^2}$.

a) (4 points) Draw the region D.

b) (16 points) Set up triple integrals representing the volume of the region D in cylindrical coordinates in the order $dz\,dr\,d\theta$.