MATH 2400: CALCULUS 3
5:15 - 6:45 pm, Mon. Mar. 7, 2016
MIDTERM 2

I have neither given nor received aid on this exam.

Name:_____

Check one below !

◯ **001** Watts ....(9AM) ◯ **005** Washabaugh ....(1PM)

◯ **002** Green ....(10AM) ◯ **006** Bulin ....(2PM)

◯ **003** Blakestad ....(11AM) ◯ **007** Chhay ....(3PM)

◯ **004** Mishev ....(12PM)

Notes, electronic devices, and any other aids are **not** permitted on this exam.

If you have a question raise your hand and remain seated. In order to receive full credit your answer must be **complete**, **logical**, **legible**, and **correct**. Show all of your work, and give adequate explanations. No shown work even with the correct final answer will lead to no points. Only give one answer to each problem! If there are two different answers to one problem, the lower score will be chosen.

DO NOT WRITE IN THIS BOX!

Problem	Points	Score
1	16 pts	
2	17 pts	
3	17 pts	
4	17 pts	
5	16 pts	
6	17 pts	
TOTAL	100 pts	

1. **(16 points)** Find a parametrization of the surface given by the intersection of the plane $x + 2y + 3z = 12$ and the solid cylinder $x^2 + y^2 \leq 1$.

2. (17 points) Consider the function $f(x, y) = (x^2 + y^2)^{\frac{3}{2}}$ and the point $P = \left(\sqrt{\frac{2}{3}}, 0\right)$.

(a) **(5 points)** Find the directional derivative of $f(x, y)$ at P in the direction towards the origin.

(b) **(4 points)** In what (unit) direction does $f(x, y)$ have its maximum rate of change at P?

(c) **(4 points)** What is the maximum rate of change in the direction from part (b)?

(d) **(4 points)** Find and sketch the set of all points Q at which the maximum rate of change of $f(x, y)$ is equal to the maximum rate of change at P from part (c).

3. (17 points) Find the absolute maximum and absolute minimum values of

$$f(x, y) = xy - 8x - y^2 + y + 2$$

over the (closed) triangular region with vertices $(0, 0)$, $(3, 0)$, and $(0, 3)$.

4. **(17 points)** Find all points on the hyperboloid of one sheet $x^2 + y^2 - z^2 = 1$ where the tangent plane is parallel to the plane $x + y - z = 0$.

5. **(16 points)** Let

$$z = f(x, y), \quad x = u^2 v^2 + 3, \quad y = -\cos(u) - v, \quad u = \frac{s}{t}, \quad v = e^{st}.$$

Suppose that f is a differentiable function of x and y and that

$$\frac{\partial z}{\partial x} = \frac{1}{x^2 + 2xy + y^2 + 1} \quad \text{and} \quad \frac{\partial z}{\partial y} = \frac{1}{x^2 + 2xy + y^2 + 1}.$$

Find $\left. \dfrac{\partial z}{\partial s} \right|_{(s,t)=(0,1)}$

6. (17 points) Compute the iterated integral

$$\int_0^1 \int_{x^{1/3}}^1 e^{y^4} \, dy \, dx.$$