

MA 26100 Exam I, Spring 2014, Spring 2014

Name \_\_\_\_\_

10-digit PUID number \_\_\_\_\_

Recitation Instructor \_\_\_\_\_

Recitation Section Number and Time \_\_\_\_\_

Instructions: MARK TEST NUMBER 01 ON YOUR SCANTRON

1. Do not open this booklet until you are instructed to.
2. Fill in all the information requested above and on the scantron sheet. On the scantron sheet fill in the little circles for your name, section number and PUID.
3. This booklet contains 12 problems, equally weighted.
4. For each problem mark your answer on the scantron sheet and also **circle it in this booklet**.
5. Work only on the pages of this booklet.
6. Books, notes, calculators or any electronic device are not allowed during this test and they should not even be in sight in the exam room. You may not look at anybody else's test, and you may not communicate with anybody else, except, if you have a question, with your instructor.
7. You are not allowed to leave during the first 20 and the last 10 minutes of the exam.
8. When time is called at the end of the exam, put down your writing instruments and remain seated. The TAs will collect the scantrons and the booklets.

## Exam Policies

1. Students must take pre-assigned seats and/or follow TAs' seating instructions.
2. Students may not open the exam until instructed to do so.
3. No student may leave in the first 20 min or in the last 10 min of the exam.
4. Students late for more than 20 min will not be allowed to take the exam; they will have to contact their lecturer within one day for permission to take a make-up exam.
5. After time is called, the students have to put down all writing instruments and remain in their seats, while the TAs will collect the scantrons and the exams.
6. Any violation of the above rules may result in score of zero.

## Rules Regarding Academic Dishonesty

1. You are not allowed to seek or obtain any kind of help from anyone to answer questions on the exam. If you have questions, consult only your instructor.
2. You are not allowed to look at the exam of another student. You may not compare answers with anyone else or consult another student until after you have finished your exam, handed it in to your instructor and left the room.
3. You may not consult notes, books, calculators. You may not handle cell phones or cameras, or any electronic devices until after you have finished your exam, handed it in to your instructor and left the room.
4. Anyone who violates these instructions will have committed an act of academic dishonesty. Penalties for academic dishonesty can be very severe and may include an F in the course. All cases of academic dishonesty will be reported immediately to the Office of the Dean of Students.

I have read and understand the exam policies and the rules regarding the academic dishonesty stated above:

STUDENT NAME: \_\_\_\_\_

STUDENT SIGNATURE: \_\_\_\_\_

MA261 Spring 2014 Exam 1, 8:00-9:00pm

1. Evaluate the limit if it exists

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^4 - y^4 + xy}{x^2 + y^2}$$

- A.  $-1$
- B.  $0$
- C.  $1$
- D.  $2$
- E. The limit does not exist

2. Suppose that  $z$  is defined implicitly as a function of  $x$  and  $y$  by the equation

$$xyz - y \sin(xy) - z^2 = 0.$$

What is the value of  $\frac{\partial z}{\partial x}$  at the point  $(1, \pi, \pi)$ ?

- A.  $\pi$
- B.  $2\pi$
- C.  $0$
- D.  $1$
- E.  $2$

3. The tangent plane to the graph of

$$f(x, y) = 2\sqrt{y^2 - 5x}$$

at the point  $(1, 3, 4)$  is given by:

- A.  $x - y + 2z = 6$
- B.  $x + y - 2z = -4$
- C.  $5x - 6y + 2z = -5$
- D.  $5x + 6y - 2z = 15$
- E.  $5x - 2y + 2z = 7$

4. Assume  $z = f(x, y)$  where  $x = s^2 - r$  and  $y = r^2s$ . Given that  $\frac{\partial z}{\partial x} = e^x + y^4$  and  $\frac{\partial z}{\partial y} = 4xy^3$ , find  $\frac{\partial z}{\partial s}$  when  $r = -1$  and  $s = 1$ .

- A.  $2e^2 + 10$
- B.  $2e^2 + 11$
- C.  $e^2 + 17$
- D.  $e + 64$
- E. 3

5. If  $f(x, y, z) = 3xy^2z^3$ , the directional derivative of  $f$  at  $(1, 1, 1)$  in the direction of  $\vec{i} + 2\vec{j} - 2\vec{k}$  is:

- A.  $-3$
- B.  $-\frac{48}{\sqrt{3}}$
- C.  $-1$
- D.  $-48$
- E.  $-\frac{1}{\sqrt{3}}$

6. The plane tangent to the surface  $2x^2 + xy^2 + z^3 = 2$  at the point  $(-1, 1, 1)$  is:

- A.  $-(x - 1) + (y + 1) + (z + 1) = 0$
- B.  $2(x - 1) - (y + 1) + 3(z + 1) = 0$
- C.  $3(x - 1) + 2(y - 1) - 3(z + 1) = 0$
- D.  $-3(x + 1) - 2(y - 1) + 3(z - 1) = 0$
- E.  $5(x + 1) + 2(y - 1) + 3(z - 1) = 0$

7. The minimum and maximum values of the function

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

on the disk  $x^2 + y^2 \leq 8$  are:

- A. 0, 14
- B. -4, 18
- C. -2, 18
- D. -2, 16
- E. -2, 14

8. The equation of the plane containing the points  $(1, 0, 3)$ ,  $(1, 1, 0)$  and  $(1, 1, 1)$  is:

- A.  $x + y = 0$
- B.  $x + y + z = 0$
- C.  $x = 1$
- D.  $x + 3z = 1$
- E.  $x - y - 3z = 3$

9. The domain of the vector function  $\mathbf{r}(t) = \langle \sqrt{t^2 - 4t + 3}, e^{3t}, \ln(t^{1/3} - 1) \rangle$  is:

- A.  $t > 1$
- B.  $t \geq 3$
- C.  $1 < t < 3$
- D.  $t$  is any real number
- E. None of the above

10. The curvature of the curve  $\mathbf{r}(t) = \langle t, 1, e^t \rangle$  at the point  $t = 0$  is:

- A.  $\langle 0, 0, 1 \rangle$
- B.  $1/(2\sqrt{2})$
- C.  $2\sqrt{2}$
- D. 1
- E.  $\langle 0, 1, 1 \rangle$

11. What is the arc length of the curve  $\mathbf{r}(t) = \langle e^t, 2e^t, 3e^t \rangle$  when  $0 \leq t \leq 1$ ?

- A.  $\sqrt{14}e^2$
- B.  $\sqrt{14}(e^2 - 1)$
- C.  $\sqrt{14}(e - 1)$
- D.  $e^2 - 1$
- E.  $e$

12. Suppose that a particle moves in 3 dimensions and has acceleration given by the vector function  $\mathbf{a}(t) = \langle 20t^3, \sin(t), 4e^{2t} \rangle$ . Suppose further that its velocity at  $t = 0$  is given by  $\langle 1, 0, 1 \rangle$ . What is its velocity when  $t = 1$ ?

- A.  $\langle 5, 1 - \cos(1), 2e^2 \rangle$
- B.  $\langle 2, -1, 1 \rangle$
- C.  $\langle 20, \sin(1), 4 \rangle$
- D.  $\langle 20, \sin(1), 2 \rangle$
- E.  $\langle 6, 1 - \cos(1), 2e^2 - 1 \rangle$