



# EXAM 1

## REVIEW

MA 26100 – FALL 2023

DR. HOOD

## Practice Exam 1 – Version B

Which problem would you most like see covered today?

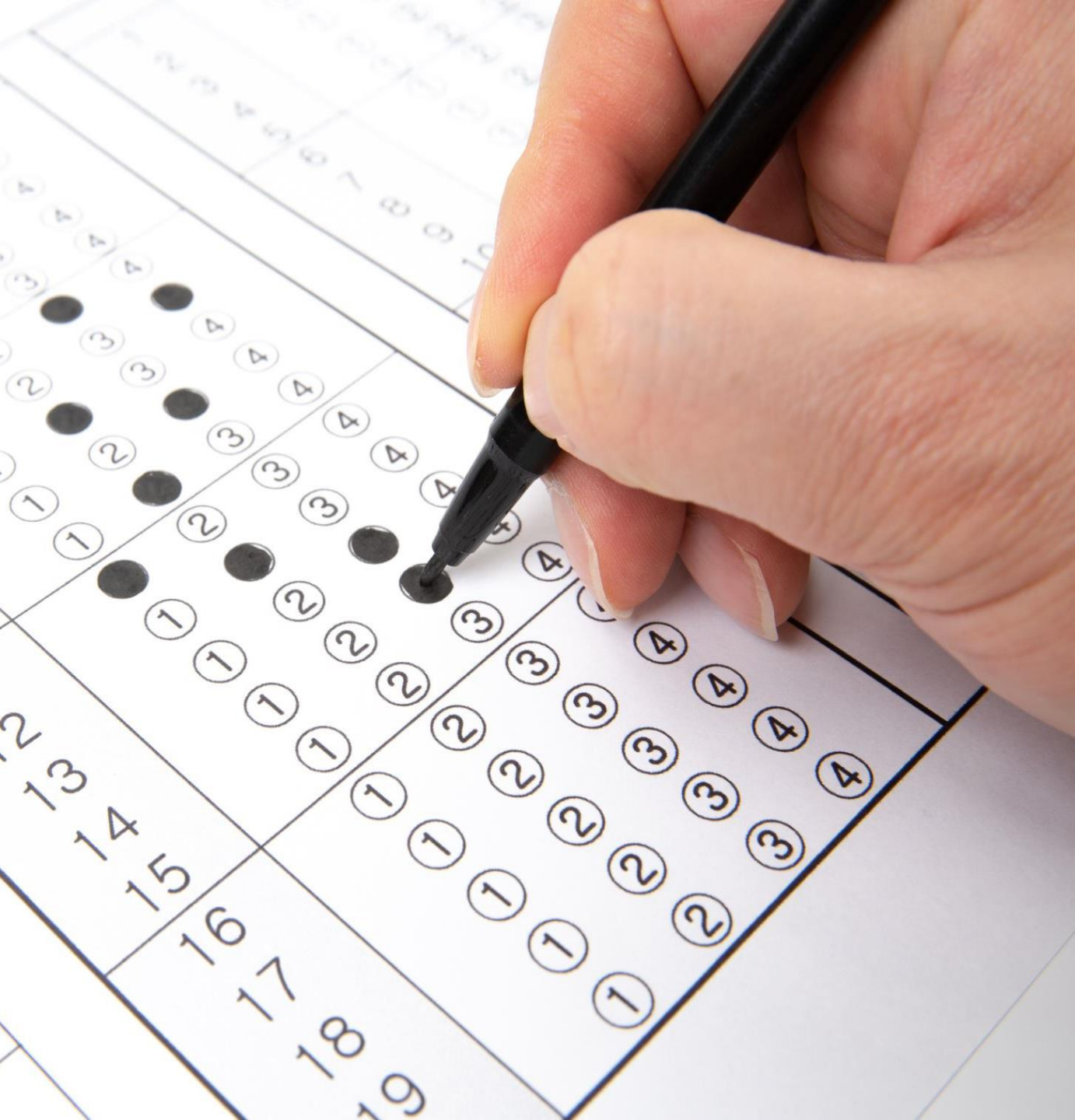
- 2) Angle between planes
- 3) Quadric surface
- 4) Vector-valued function
- 5) Motion in space
- 6) Curvature
- 7) Level curves
- 8) Limits
- 9) Partial derivatives
- 10) Implicit differentiation
- 11) Directional derivatives
- 12) Tangent plane
- 13) Maxima & Minima

# ANNOUNCEMENTS

- HW 17 is now due on Wed Oct 11 at 11:59pm
- Office Hour moved
  - Extra Office Hour Tues Oct 3 at 3-4pm in MATH 844
  - Office Hour on Wed Oct 4 is cancelled

# EXAM 1 INFORMATION

- Tuesday, October 3, 2023 at Time: 8:00pm – 9:00pm
- Location: ELLT 116 and Loeb Playhouse.
  - Seating chart:  
[https://www.math.purdue.edu/academic/courses/semester/202410/ma26100/resources/ma261\\_exam\\_seating\\_chart.pdf](https://www.math.purdue.edu/academic/courses/semester/202410/ma26100/resources/ma261_exam_seating_chart.pdf)
- Lessons covered on the exam: Lessons 1 – 16.
  - Study Guide:  
[https://www.math.purdue.edu/~kthood/docs/MA261\\_Fall2023/exam1\\_study\\_guide\\_ma261\\_fa23-merged.pdf](https://www.math.purdue.edu/~kthood/docs/MA261_Fall2023/exam1_study_guide_ma261_fa23-merged.pdf)



# EXAM 1 REVIEW

Supplemental Instruction

Monday, October 2, 2023

6:30pm – 8:20pm

UC 114



# Exam 1 Study Guide

MA 261 · Fall 2023

**Exam 1 is Tuesday, Oct 3 at 8:00pm – 9:00pm.**

**Exam Format:** The exam will be in-person. You will have 1 hour (60 minutes) to complete the exam. It is a multiple-choice exam with a total of 12 questions. Each question is worth 8 points, and you will earn 4 points for filling out the scantron correctly.

**Exam Material:** The exam will cover Lessons 1 – 16 (Chapters 13-14, and 15.1-15.7). Exam 1 will not cover Section 15.8 Lagrange Multipliers. A detailed list of learning objectives, definitions, and practice problems is included in the table below.

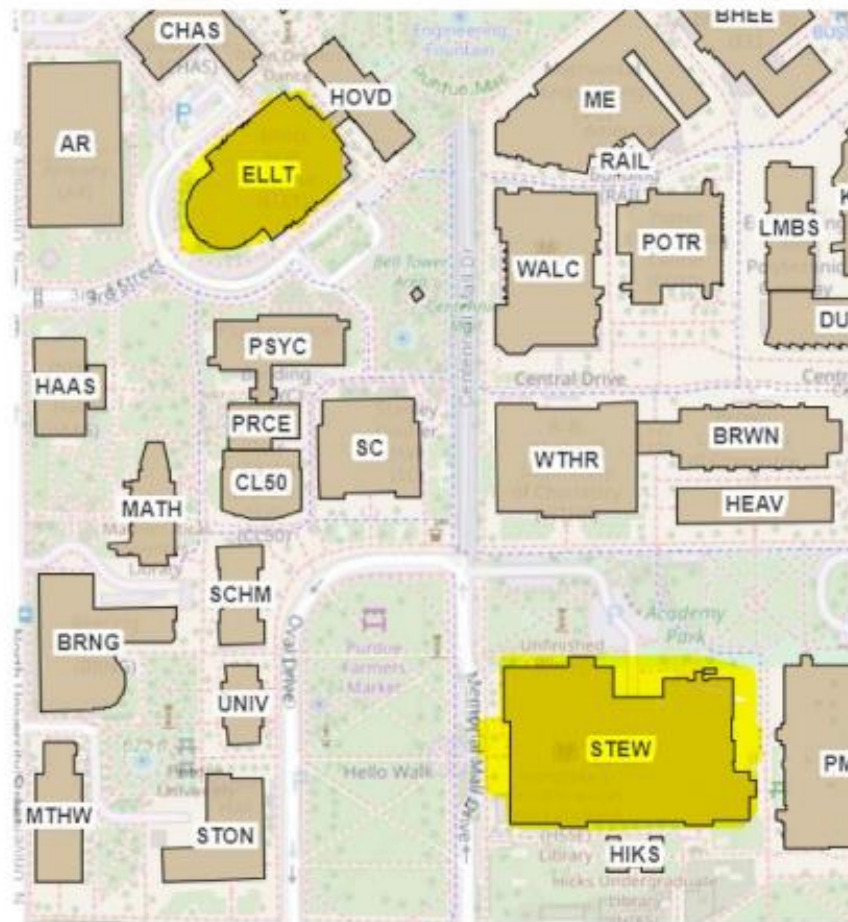
## Past Exam Archive:

<https://www.math.purdue.edu/academic/courses/oldexams.php?course=MA26100>

**Exam Conflicts:** If a student has a conflict with the evening exam, they must provide documentation with the Exam Conflict Form:

[https://www.math.purdue.edu/~kthood/docs/MA261\\_Fall2023/exam\\_conflict\\_form\\_ma261\\_fa23.pdf](https://www.math.purdue.edu/~kthood/docs/MA261_Fall2023/exam_conflict_form_ma261_fa23.pdf)

**ADA Accommodated Exams:** Most students are automatically scheduled for their ADA exam. You should have received an email with details (and you may need to check your spam folder). For those students who were not automatically enrolled, Dr. Hood has sent you an email with further instructions.



**Exam Location:** The exam will be in ELLT 116 and in STEW 183 (Loeb Playhouse). You will be assigned a room with your TA. All the students who have the same TA will sit in the same area of the exam room. There should be empty seats to your left and right, and a person in the seat in front of you and the seat behind you.

You can view your room assignment here:

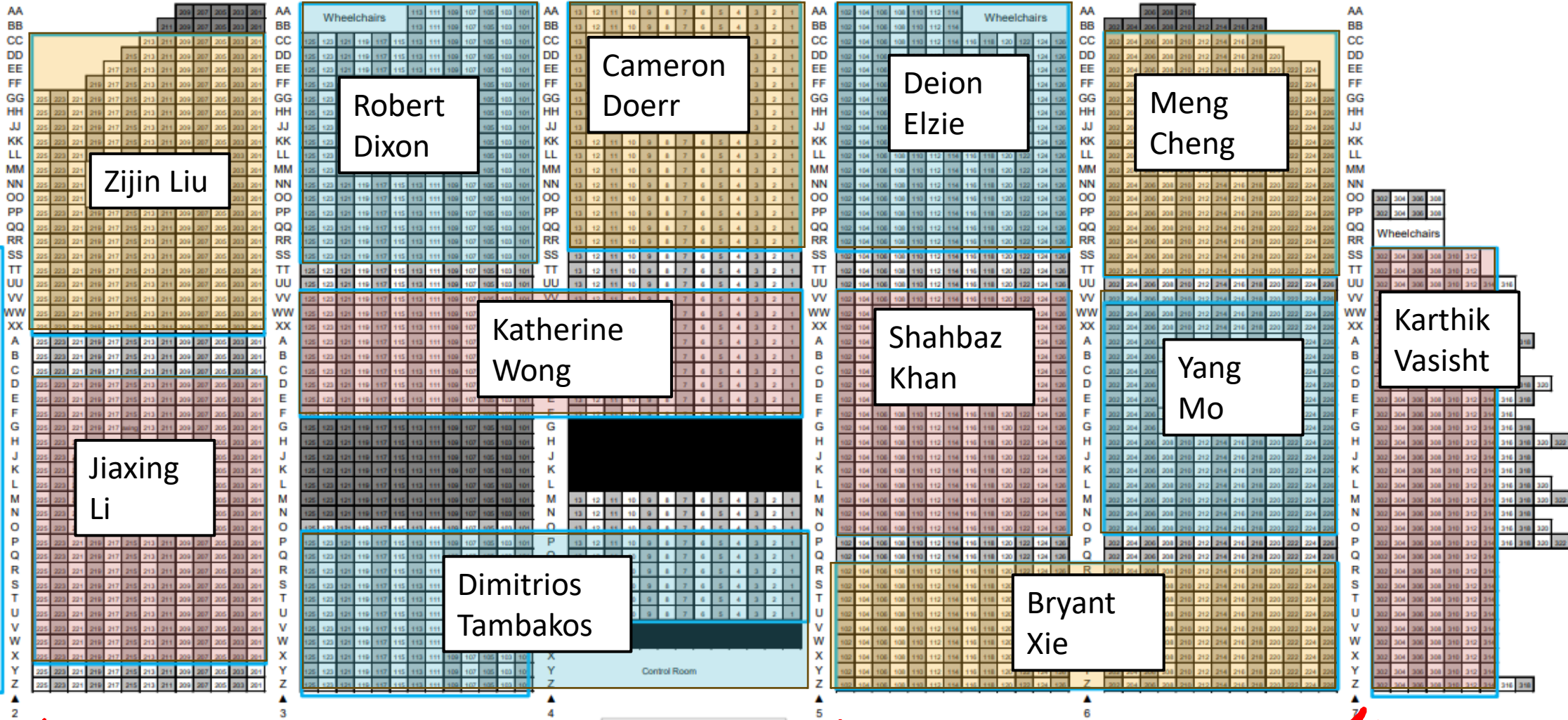
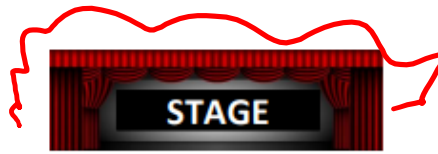
[https://www.math.purdue.edu/academic/courses/semester/202410/ma26100/resources/ma261\\_exam\\_seating\\_chart.pdf](https://www.math.purdue.edu/academic/courses/semester/202410/ma26100/resources/ma261_exam_seating_chart.pdf)



MA 26100  
Exam 1

Elliot Hall Main Floor ELLT 116

Tuesday, October 3, 2023  
8:00 - 9:00 p.m.



NO STUDENTS IN BLACK AREA.  
GRAY AREA BAD LIGHTING.







**MA 26100**  
**Exam 1**  
**Tues., Oct. 3, 2023**  
**8:00-9:00 p.m.**  
**Loeb Balcony**

	114	12	110	108	106	104	102	<b>NN</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	<b>NN</b>	101	103	105	107	109	111	113														
				108	106	104	102	<b>MM</b>		1	2	3	4	5	6	7	8	9	10				<b>MM</b>	101	103	105	107																	
			112	110	108	106	104	102	<b>LL</b>	1	2	3	4	5	6	7	8	9	10	11	12	13		<b>LL</b>	101	103	105	107	109	111														
			112	110	108	106	104	102	<b>KK</b>		1	2	3	4	5	6	7	8	9	10	11	12		<b>KK</b>	101	103	105	107	109	111														
			112	110	108	106	104	102	<b>JJ</b>		1	2	3	4	5	6	7	8	9	10	11	12		<b>JJ</b>	101	103	105	107	109	111														
			112	110	108	106	104	102	<b>HH</b>		1									9	10	11		<b>HH</b>	101	103	105	107	109	111														
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126	124	122	120	118	116			114	112	110	108	106	104	102	<b>FF</b>	1	2	3					11	12	13	14	<b>FF</b>	101	103	105	107	109	111	113	115	117	119	121	123	125				
126	124	122	120	118	116			114	112	110	108	106	104	102	<b>EE</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	<b>EE</b>	101	103	105	107	109	111	113	115	117	119	121	123	125	
128	126	124	122	120	118	116		114	112	110	108	106	104	102	<b>DD</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	<b>DD</b>	101	103	105	107	109	111	113	115	117	119	121	123	125	127
128	126	124	122	120	118	116		114	112	110	108	106	104	102	<b>CC</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	<b>CC</b>	101	103	105	107	109	111	113	115	117	119	121	123	125	127
126	124	122	120	118	116			114	112	110	108	106	104	102	<b>BB</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	<b>BB</b>	101	103	105	107	109	111	113	115	117	119	121	123	125	
126	124	122	120	118	116			114	112	110	108	106	104	102	<b>AA</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	<b>AA</b>	101	103	105	107	109	111	113	115	117	119	121	123	125	

Manav  
 Batavia

You should know:

- Your TA's name
- Your REC #
- Your PUID

SEE IMPORTANT MARKING INSTRUCTIONS ON SIDE 2

LAST NAME	FIRST NAME	MI
PURDUE	PETE	P

PURDUE UNIVERSITY IDP-0

USE A #2 PENCIL ONLY

1 T F (A) (B) (C) (D) (E)  
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14 T F (A) (B) (C) (D) (E)  
15 T F (A) (B) (C) (D) (E)

COMPLETE ALL INFORMATION AS DIRECTED

SECTION NUMBER	TEST/QUIZ NUMBER	STUDENT IDENTIFICATION NUMBER
801	1003	0077777777

DATE: Oct 3, 2023  
COURSE: MA 261  
INSTRUCTOR: TA Name

SIGNATURE: Pete Purdue

### Exam Rules:

**Test Booklet:** There will be a scantron (left) and a test booklet. Students may not open the test booklet until instructed.

**Test/Quiz Number:** There will be ten versions of the exam, each with a 4-digit "Test/Quiz Number". The student must put the "Test/Quiz Number" on the scantron in order for their scantron to be correctly graded.

**Please Bring:** A number 2 pencil, your PUID, your REC section number, and your TA's name.

**Prohibited Items:** Notes, Textbooks, Calculator, Phones, Smart Watches, and all other Electronic Devices. You are not allowed to communicate to anyone else during the exam except, if you have a question, your TA or lecturer.

***\*If a student uses one of the prohibited items during the exam, it will be considered a violation of the academic honesty policy and reported to the Office of the Dean of Students. All electronic devices should be turned off and put away out of sight.***

**Late Policy:** Students must arrive promptly to take the exam. If a student arrives more than 20 minutes late, they will not be permitted to take the exam. Instead, the student will have to take a make-up exam with a 20% late penalty. Additionally, if a student finishes early, they cannot leave the exam room until after 20 minutes have passed.

**Leaving Early Policy:** In the last 10 minutes, students may not leave the exam room. This is to minimize noise and distractions for the other students still working on the exam. The student may raise their hand and turn in the exam to the TA or proctor, but they must remain seated.







## Problem 2

Which of the following pairs of planes are orthogonal to each other?

To receive the full 5 points, you must show all your work on this problem.

A.  $x = 5z + 3y, 8x - 6y + 2z = -1$

B.  $x + 10y - z = 6, -9x - y - 19z = 2$

C.  $5x + 8y = -3, y + 6z = 1$

D.  $8x + 5y = -3, y + 6z = -1$

E.  $8x + 5y = -3, 9y + 6z = -1$

### Problem 3

Identify the surface defined by  $x^2 - y^2 - 4x + z^2 = 4$ .

- A. ellipsoid
- B. hyperboloid of one sheet
- C. hyperbolic paraboloid
- D. cone
- E. hyperboloid of two sheets

## Problem 4

The domain of the vector function  $r(t) = \left\langle \sqrt{t^2 - 4t + 3}, e^{3t}, \ln\left(t^{\frac{1}{3}} - 1\right) \right\rangle$

To receive the full 5 points, you must show all your work on this problem.

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

### Problem 5

(8 points)

A traveling particle has position vector at time  $t$  given by  $\vec{r}(t) = \langle t \cos t, t \sin t, 9 - t^2 \rangle$ . Find its speed at  $t = 1$ .

To receive the full 5 points, you must show all your work on this problem.

- A.  $\sqrt{2\pi}$
- B.  $\sqrt{6}$
- C.  $3\pi$
- D.  $\tan(1)$
- E. 5



## Problem 6

Let  $r(t) = \langle t, \frac{1}{2}t^2, \frac{1}{3}t^3 \rangle$ , find  $\kappa(1)$  (namely, the curvature at  $t=1$ ).

A.  $-1/3$

B.  $1$

C.  $\frac{\sqrt{3}}{3}$

D.  $1/3$

E.  $\frac{\sqrt{2}}{3}$

## Problem 7

The level curves of  $f(x,y) = \sqrt{x^2 + 4y^2 + 4} - x$  are

- A. hyperbolas
- B. ellipses
- C. sometimes lines and sometimes ellipses
- D. circles
- E. parabolas

## Problem 8

If

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^4 - 3a(x^2 + y^2) - y^4}{x^2 + y^2} = 12$$

then the number  $a$  must be equal to

- A. 6
- B. 12
- C. 3
- D. 4
- E. -4

## Problem 9

If  $f(x,y) = \ln(x^2 + y^4 + 2)$ , compute  $f_{xy}(2,1)$ .

To receive the full 5 points, you must show all your work on this problem.

- A.  $-10/49$
- B.  $12/49$
- C.  $-16/49$
- D.  $-4/7$
- E.  $4/7$



## Problem 10

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

$$\cos(xyz) = x + 3y + 2z.$$

Use implicit differentiation to find the value of  $\frac{\partial z}{\partial y}$  at  $(0,1)$ .

- A.  $1/3$
- B.  $-3/5$
- C.  $-1/2$
- D.  $-3/2$
- E.  $-2/3$

## Problem 11

Find the maximum rate of change of  $f(x,y) = \sqrt{7 - x^2 - y^2}$  at the point  $(-2, 1)$ .

To receive the full 5 points, you must show all your work on this problem.

- A.  $\frac{5}{\sqrt{2}}$
- B.  $\frac{\sqrt{10}}{2}$
- C.  $\sqrt{8}$
- D.  $\frac{3}{\sqrt{2}}$
- E.  $1/4$

## Problem 12

Find  $a$  so that the point  $(3, a, 1)$  is on the tangent plane to  $z = e^{xy} - 4x^2y + 3y^2$  at  $(0, 1, 4)$ .

To receive the full 5 points, you must show all your work on this problem.

- A.  $-1/7$
- B.  $0$
- C.  $1/2$
- D.  $-1/2$
- E.  $1/6$

## Problem 13

Consider the function

$$f(x,y) = \frac{1}{4}x^4 + xy + \frac{1}{4}y^4 \text{ on } \mathbb{R}^2$$

Then the function

- A. has one local maximum and two local minima.
- B. has 4 critical points.
- C. has one saddle point and two local minima.
- D. has an absolute maximum and absolute minimum.
- E. is always positive and hence has absolute minimum of 0.