

MA 16600  
EXAM 2 INSTRUCTIONS  
VERSION 01  
March 5, 2024

Your name \_\_\_\_\_ Your TA's name \_\_\_\_\_

Student ID # \_\_\_\_\_ Section # and recitation time \_\_\_\_\_

1. You must use a #2 pencil on the scantron sheet (answer sheet).
2. Check that the cover of your exam booklet is GREEN and that it has VERSION 01 on the top. Write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below.
3. On the scantron sheet, fill in your **TA's name, i.e., the name of your recitation instructor (NOT the lecturer's name)** and the course number.
4. Fill in your NAME and PURDUE ID NUMBER, and blacken in the appropriate spaces.
5. Fill in the four-digit **SECTION NUMBER**. Your section number is a 3 digit number. Put 0 at the front to make it a 4 digit number, and then fill it in.
6. **Sign the scantron sheet.**
7. Blacken your choice of the correct answer in the space provided for each of the questions 1–12. While mark all your answers on the scantron sheet, you should show your work on the exam booklet. Although no partial credit will be given, any disputes about the grade or grading will be settled by examining your written work on the exam booklet.
8. There are 12 questions, each of which is worth 8 points. You get 4 free points for trying. The maximum possible score is  
 $12 \text{ questions} \times 8 \text{ points} + 4 \text{ free points} = 100 \text{ points}.$
9. NO calculators, electronic device, books, or papers are allowed. Use the back of the test pages for scrap paper.
10. After you finish the exam, turn in BOTH the scantron sheet and the exam booklet.
11. If you finish the exam before 7:25, you may leave the room after turning in the scantron sheet and the exam booklet. If you don't finish before 7:25, you should REMAIN SEATED until your TA comes and collects your scantron sheet and exam booklet.

## Exam Policies

1. There is no individual seating. Just 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 5 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/proctors will collect the scantron sheet and the exam booklet.
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/proctor 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: \_\_\_\_\_

Recitation Section numbers by TA:

| 7:30 am Lecture                    |                     |           |
|------------------------------------|---------------------|-----------|
| TA name                            | Time & Location     | Section # |
| Yannis Yicong Wu-Yip               | 4:30pm in PHYS 110  | 0208      |
| Yannis Yicong Wu-Yip               | 3:30pm in PHYS 110  | 0215      |
| Yannis Yicong Wu-Yip               | 2:30pm in PHYS 110  | 0222      |
| Deanna Marie Wightman              | 3:30pm in PHYS 202  | 0229      |
| Deanna Marie Wightman              | 2:30pm in PHYS 202  | 0236      |
| Deanna Marie Wightman              | 4:30pm in PHYS 202  | 0243      |
| Barath Balasubramanian Ramakrishna | 9:30pm in PHYS 333  | 0250      |
| Barath Balasubramanian Ramakrishna | 8:30am in PHYS 333  | 0257      |
| Barath Balasubramanian Ramakrishna | 10:30am in PHYS 333 | 0264      |
| Mei Lam Chan                       | 1:30pm in Schm 307  | 0296      |
| Mei Lam Chan                       | 2:30pm in Schm 307  | 0297      |
| Mei Lam Chan                       | 12:30pm in Schm 307 | 0298      |

| 1:30pm Lecture           |                      |           |
|--------------------------|----------------------|-----------|
| TA name                  | Time & Location      | Section # |
| Shengwei Qiu             | 2:30pm in PHYS 333   | 0271      |
| Shengwei Qiu             | 1:30pm in PHYS 333   | 0278      |
| Shengwei Qiu             | 12:30pm in PHYS 333  | 0285      |
| Giancarlo Thomas Arcese  | 2:30pm in HAMP 2101  | 0287      |
| Giancarlo Thomas Arcese  | 1:30pm in HAMP 2101  | 0288      |
| Giancarlo Thomas Arcese  | 12:30pm in HAMP 2101 | 0289      |
| Jiarui Huang             | 10:30am in PHYS 202  | 0290      |
| Jiarui Huang             | 12:30pm in PHYS 202  | 0291      |
| Jiarui Huang             | 11:30am in PHYS 202  | 0292      |
| Asini Anuradhika Konpola | 9:30am in PHYS 202   | 0293      |
| Asini Anuradhika Konpola | 7:30am in PHYS 202   | 0294      |
| Asini Anuradhika Konpola | 8:30am in PHYS 202   | 0295      |

## Questions

1. (8 points) Compute  $\int \sin^3(x) \cos^{3/2}(x) dx$ .

A.  $-\frac{2}{5} \cos^{5/2}(x) - \frac{2}{7} \cos^{7/2}(x) + C$

B.  $\frac{2}{5} \cos^{5/2}(x) - \frac{2}{9} \cos^{9/2}(x) + C$

C.  $\frac{2}{3} \cos^{3/2}(x) - \frac{2}{9} \cos^{9/2}(x) + C$

D.  $\frac{2}{9} \cos^{9/2}(x) - \frac{2}{5} \cos^{5/2}(x) + C$

E.  $\frac{2}{9} \sin^{9/2}(x) - \frac{2}{5} \sin^{5/2}(x) + C$

2. (8 points) Compute  $\int_0^{\pi/4} \tan(x) \sec^3(x) dx$ .

A.  $\frac{4\sqrt{2} - 1}{3}$

B.  $2\sqrt{2} - 1$

C.  $\frac{\pi}{4} - \frac{1}{16}$

D.  $\frac{\pi}{4} - \frac{1}{32}$

E.  $\frac{2\sqrt{2} - 1}{3}$

3. (8 points) Compute the integral

$$\int_0^{\pi/2} \cos^4(2x) dx.$$

- A.  $\pi/6$
- B.  $\pi/5$
- C.  $2\pi/9$
- D.  $3\pi/16$
- E.  $5\pi/8$

4. (8 points) Compute the integral  $\int \frac{1}{x^2\sqrt{9-x^2}}dx$ .

A.  $\sqrt{9-x^2} + C$

B.  $\frac{1}{x\sqrt{9-x^2}} + C$

C.  $x\sqrt{9-x^2} + C$

D.  $\frac{x\sqrt{9-x^2}}{9-x^2} + C$

E.  $-\frac{\sqrt{9-x^2}}{9x} + C$

5. (8 points) Compute the integral  $\int \frac{1}{\sqrt{x^2 - 4x}} dx$  for  $x > 2$ .

A.  $\ln \left| \frac{(x-2)}{2} + \sqrt{x^2 - 4x} \right| + C$

B.  $\ln \left| \frac{(x-2)}{2} + \frac{(\sqrt{x^2 - 4x})}{2} \right| + C$

C.  $\ln \left| \frac{(x-2)(\sqrt{x^2 - 4x})}{2} \right| + C$

D.  $\ln \left| \sqrt{x^2 - 4x} \right| + C$

E.  $\ln \left| \frac{2(x^2 - 4x)^{3/2}}{3} \right| + C$



6. (8 points) Compute the integral  $\int_{-2}^{-1} \frac{x+2}{\sqrt{x^2+4x+5}} dx$

A.  $\sqrt{3} - 1$

B.  $\sqrt{2} - 1$

C. 1

D.  $\pi - 1$

E.  $\frac{\pi}{3}$

7. (8 points) Which of the following is the partial fraction decomposition form of

$$\frac{x^3}{(x^2 + 4)(x - 4)^2}?$$

- A.  $\frac{A}{(x - 4)^2} + \frac{B}{x^2 + 4}$
- B.  $\frac{Ax + B}{(x - 4)^2} + \frac{Cx}{x^2 + 4}$
- C.  $\frac{Ax^2 + Bx + C}{(x - 4)^2} + \frac{Dx + E}{x^2 + 4}$
- D.  $\frac{A}{x - 4} + \frac{B}{(x - 4)^2} + \frac{Cx + D}{x^2 + 4}$
- E.  $\frac{A}{x - 4} + \frac{B}{(x - 4)^2} + \frac{C}{x^2 + 4}$

Note: The letters  $A, B, C, D, E$  in the partial fractions above represent some appropriate constants.

8. (8 points) Evaluate the integral

$$\int_3^4 \frac{3 - 2x}{x^2 - 4x + 4} dx.$$

A.  $-2 \ln(4) - \frac{3}{2}$

B.  $-\ln(2) + \frac{5}{3}$

C.  $-\ln(2) - 1$

D.  $-2 \ln(2) - \frac{1}{2}$

E.  $-2 \ln(4) + 2 \ln(3) - \frac{3}{2}$

9. (8 points) Evaluate the improper integral  $\int_0^{\infty} \frac{e^x}{e^{2x} + 1} dx$ .

A.  $\frac{\pi}{3}$

B.  $\frac{\pi}{4}$

C.  $\frac{\sqrt{2}\pi}{2}$

D.  $\pi$

E. The integral is divergent.

10. (8 points) Which of the following improper integrals converge?

I:  $\int_0^{\infty} x e^{-x^2} dx.$

II:  $\int_0^2 \frac{1}{x-1} dx.$

III:  $\int_0^2 \frac{1}{(x-1)^{1/2}} dx.$

- A. I and III only.
- B. I,II, and III.
- C. II and III only.
- D. I and II only.
- E. None of the Above.

11. (8 points) Compute the following limit:

$$\lim_{n \rightarrow \infty} \left( \frac{(n+1)!}{(n-1)!} \right) \left( \frac{\sin(1/n)}{3n^2} \right)$$

- A.  $\frac{1}{3}$
- B. 0
- C. 1
- D.  $\pi$
- E. The sequence diverges.

12. (8 Points) Compute the sum of the series

$$\sum_{n=0}^{\infty} \frac{3^{n+1} - 2^{n+4}}{6^n}$$

A. 5

B. -16

C. 24

D. -18

E. 16