

MA 16200
EXAM 1 Green
February 6, 2019

NAME _____ YOUR TA'S NAME _____

STUDENT ID # _____ RECITATION TIME _____

Write the following in the TEST/QUIZ NUMBER boxes:

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 (and blacken in the appropriate digits below the boxes)

You must use a #2 pencil on the mark-sense sheet (answer sheet). On the mark-sense sheet, fill in your TA's name and the COURSE number. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces. Fill in your four-digit SECTION NUMBER. If you do not know your section number, ask your TA. Sign the mark-sense sheet.

There are 12 questions, each worth 8 points (you will automatically earn 4 points for taking the exam). Blacken in your choice of the correct answer in the spaces provided for questions 1-12. Do all your work in this exam booklet. Use the back of the test pages for scrap paper. Turn in both the mark-sense sheet and the exam booklet when you are finished.

If you finish the exam before 8:50, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 8:20. If you don't finish before 8:50, you MUST REMAIN SEATED until your TA comes and collects your scantron sheet and your exam booklet.

EXAM POLICIES

1. Students may not open the exam until instructed to do so.
2. Students must obey the orders and requests by all proctors, TAs, and lecturers.
3. No student may leave in the first 20 min or in the last 10 min of the exam.
4. Books, notes, calculators, or any electronic devices are not allowed on the exam, and they should not even be in sight in the exam room. Students may not look at anybody else's test, and may not communicate with anybody else except, if they have a question, with their TA or lecturer.
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 these rules and any act of academic dishonesty may result in severe penalties. Additionally, all violators will be reported to the Office of the Dean of Students.

I have read and understand the exam rules stated above:

STUDENT NAME: _____

STUDENT SIGNATURE: _____

1. The equation

$$x^2 + y^2 + z^2 + 2x - 4y + 6z = C$$

is a sphere of radius 2. What is C ?

- A. $C = -12$
- B. $C = 4$
- C. $C = 14$
- D. $C = 2$
- E. $C = -10$

2. $\vec{v} = \langle 2, 3, 6 \rangle$ and $\vec{w} = \langle 1, -2, 3 \rangle$. Find $\text{proj}_{\vec{v}}\vec{w}$, the vector projection of \vec{w} onto \vec{v} .

- A. $\langle 3, 0, -1 \rangle$
- B. $\left\langle \frac{2}{7}, \frac{3}{7}, \frac{6}{7} \right\rangle$
- C. $\langle 2, -4, 6 \rangle$
- D. $\left\langle \frac{4}{7}, \frac{6}{7}, \frac{12}{7} \right\rangle$
- E. $\langle 1, -2, 3 \rangle$

3. Which of the following statements are true?

- (i) $2\vec{i}$ and $\vec{j} + \vec{k}$ are orthogonal vectors
- (ii) If \vec{v} is a vector in three dimensions, $\vec{v} \times \vec{v} = \vec{0}$
- (iii) If \vec{w} is a vector, $\vec{w} \cdot \vec{w} = |\vec{w}|$

- A. (i) and (ii) only
- B. (i) and (iii) only
- C. Only one of the three statements is true
- D. (ii) and (iii) only
- E. (i), (ii), and (iii) are all true

4. Suppose $|\vec{a}| = 4$ and $\vec{b} = \vec{i} + 4\vec{j} + 8\vec{k}$ and the angle between \vec{a} and \vec{b} is $\frac{\pi}{6}$. What is $|\vec{a} \times \vec{b}|$?

- A. 36
- B. 26
- C. $9\sqrt{3}$
- D. 9
- E. 18

5. The area between the curves $y = x^2$ and $x + y = 2$ is given by

A. $\int_{-2}^1 (2 - x - x^2) dx$

B. $\int_0^2 (\sqrt{y} + y - 2) dy$

C. $\int_{-2}^1 (x^2 + x - 2) dx$

D. $\int_{-1}^2 (2 - x - x^2) dx$

E. $\int_{-1}^2 (x^2 + x - 2) dx$

6. Find the area bounded by the curves $y = 2 - x^2$ and $y = |x|$

A. $\frac{10}{3}$

B. $\frac{7}{6}$

C. $\frac{13}{3}$

D. $\frac{7}{3}$

E. $\frac{13}{6}$

7. Use cylindrical shells to find a formula for the volume of the following solid: the region bounded by $y = x^2$ and $y = 1$ is revolved about the line $y = 3$.

A. $\int_{-1}^1 2\pi(1 - y)y^{1/2}dy$

B. $\int_0^1 2\pi(3 - y)y^{1/2}dy$

C. $\int_0^1 4\pi(3 - y)y^{1/2} dy$

D. $\int_0^1 2\pi(3 - x)x^2dx$

E. $\int_{-1}^1 \pi(1 - x^2) dx$

8. It requires a force of 12 N to hold a spring 0.1 m longer than its natural length. How much work (in N·m) is required to stretch it from its natural length into this position?

A. 0.6

B. 1.2

C. 12

D. 0.006

E. 6

9. What is the average value of the function $f(x) = \sin^3 x$ over the interval $0 \leq x \leq \pi$?

A. $\frac{1}{8\pi}$

B. $\frac{4}{3\pi}$

C. $\frac{\sqrt{2}}{4\pi}$

D. $\frac{8}{3\pi}$

E. $\frac{1}{2\pi}$

10. Compute $\int_0^{\pi/4} \tan x \sec^3 x \, dx$

A. 1

B. $\frac{3}{4}$

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

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

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

11. Find the volume of the solid that results from rotating the area between the curves $y^2 = x - 1$ and $y = x - 1$ around the y -axis.

- A. $\frac{3\pi}{7}$
- B. $\frac{7\pi}{15}$
- C. $\frac{\pi}{6}$
- D. $\frac{\pi}{3}$
- E. $\frac{\pi}{10}$

12. Find $\int \frac{\cos(\frac{x}{4})}{e^x} dx$

- A. $\frac{4 \cos(\frac{x}{4}) - 16 \sin(\frac{x}{4})}{15e^x} + C$
- B. $\frac{4 \sin(\frac{x}{4}) - 16 \cos(\frac{x}{4})}{17e^x} + C$
- C. $\frac{4 \sin(\frac{x}{4}) - 16 \cos(\frac{x}{4})}{15e^x} + C$
- D. $\frac{16 \sin(\frac{x}{4}) - 4 \cos(\frac{x}{4})}{15e^x} + C$
- E. $\frac{16 \sin(\frac{x}{4}) - 4 \cos(\frac{x}{4})}{17e^x} + C$