

MA 16200
EXAM 1 Form 01
February 6, 2020

NAME _____ YOUR TA'S NAME _____

STUDENT ID # _____ RECITATION TIME _____

Be sure the paper you are looking at right now is GREEN! Write the following in the TEST/QUIZ NUMBER boxes (and blacken in the appropriate spaces below the boxes):

01

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 point 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 scantron 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. A sphere is described by the equation $2x^2 + 2y^2 + 2z^2 = 8x - 12y + 2$. What is the radius of the sphere?

- A. 5
- B. $\sqrt{18}$
- C. 2
- D. $\sqrt{14}$
- E. $\sqrt{28}$

2. Find the value(s) of x such that the vector $\langle x, -\frac{x}{2} \rangle$ is a unit vector.

- A. $x = \frac{4}{5}$
- B. $x = \pm\sqrt{\frac{2}{3}}$
- C. $x = 2$
- D. $x = \pm\frac{2}{\sqrt{3}}$
- E. $x = \pm\frac{2}{\sqrt{5}}$

3. Let \mathbf{u} and \mathbf{v} be given three dimensional vectors. How many of the following expressions are always mathematically valid?

I. $|\mathbf{v}| \geq 0$

II. $|\mathbf{u} + \mathbf{v}| = |\mathbf{u}| + |\mathbf{v}|$

III. $\mathbf{u} \times \mathbf{v} = -(\mathbf{v} \times \mathbf{u})$

IV. $\mathbf{u} \cdot \mathbf{v} = \mathbf{v} \cdot \mathbf{u}$

V. $\mathbf{u} \cdot \mathbf{v} = |\mathbf{u}||\mathbf{v}| \sin \theta$ where θ is the angle between the vectors

A. 1

B. 2

C. 3

D. 4

E. 5

4. Determine the cross product $\mathbf{u} \times \mathbf{v}$ for the given vectors $\mathbf{u} = \langle 2, 1, 0 \rangle$ and $\mathbf{v} = \langle 1, 0, 1 \rangle$.

A. $\langle -1, -2, -1 \rangle$

B. $\langle -1, 2, 1 \rangle$

C. $\langle 1, -2, -1 \rangle$

D. $\langle 1, 2, -1 \rangle$

E. $\langle 1, 2, 1 \rangle$

5. Calculate the work done by pulling a sled 2 meters horizontally with a constant force of 5 Newtons at an angle 30° to the horizon.

- A. $5\sqrt{3}$ joules
- B. $5\sqrt{2}$ joules
- C. 5 joules
- D. $\frac{7}{2}\sqrt{3}$ joules
- E. $\frac{7}{2}\sqrt{2}$ joules

6. Find the value of x such that the vectors $\langle 1, x, 0 \rangle$ and $\langle 2, -1, 2 \rangle$ are orthogonal.

- A. $x = 1$
- B. $x = 2$
- C. $x = 2\sqrt{2}$
- D. $x = -2\sqrt{2}$
- E. $x = -2$

7. Find the area of the region enclosed by $x = y^2$ and $x = 8 - y^2$.

- A. $8/3$
- B. $64/3$
- C. $32/3$
- D. $16/3$
- E. $4/3$

8. Find the volume of the solid whose base is the region bounded by $y = x^2$, the x -axis and $x = 2$ and whose cross-sections taken perpendicular to the x -axis are squares.

- A. $16/5$
- B. $8/3$
- C. $32/5$
- D. $4/3$
- E. $2/3$

9. Find the volume of the solid obtained by rotating the region bounded by $x = 0$, $y = 0$, $y = 1/2$ and $y = \ln(x)$ about the y -axis.

- A. $\frac{\pi}{2}(e^2 - 1)$
- B. $\frac{\pi}{2}(e - 1)$
- C. $\frac{\pi}{8}(e - 1)$
- D. $\frac{\pi}{4}(e^2 - 1)$
- E. $\frac{\pi}{8}(e^2 - 1)$

10. Find the surface area of the surface obtained by rotating $y = x^3$, $0 \leq x \leq 1$ about the x -axis.

- A. $\frac{\pi}{27}(10^{(3/2)} - 1)$
- B. $\frac{\pi}{9}(10^{(3/2)} - 1)$
- C. $\frac{\pi}{18}(10^{(3/2)} - 1)$
- D. $\frac{\pi}{54}(10^{(3/2)} - 1)$
- E. $\frac{\pi}{3}(10^{(3/2)} - 1)$

11. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$ and $y = x$ about the line $x = 3$.

- A. $\int_0^1 2\pi(1-x)^2(x-x^2) dx$
- B. $\int_0^1 2\pi(3-x)(x-x^2) dx$
- C. $\int_0^1 2\pi(1-x)(x-x^2)^2 dx$
- D. $\int_0^1 2\pi(1-x)^2(x-x^2)^2 dx$
- E. $\int_0^1 2\pi(3-x)^2(x-x^2) dx$

12. If the work needed to stretch a spring 2 feet beyond its natural length is 8 ft-lb, how much work is needed to stretch the spring 6 inches beyond its natural length?

- A. $\frac{1}{4}$ ft-lb
- B. 2 ft-lb
- C. $\frac{3}{2}$ ft-lb
- D. 1 ft-lb
- E. $\frac{1}{2}$ ft-lb