

MA 16200
EXAM 1 Form A
September 17, 2015

NAME _____ YOUR TA'S NAME _____

STUDENT ID # _____ RECITATION TIME _____

1. You must use a #2 pencil on the mark-sense sheet (answer sheet).
2. If the cover of your question booklet is GREEN, write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below. If the cover is ORANGE, write 02 in the TEST/QUIZ NUMBER boxes and darken the spaces below.
3. On the mark-sense sheet, fill in your TA's name and the course number.
4. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces.
5. Fill in your four-digit SECTION NUMBER. If you do not know your section number, please ask your TA.
6. Sign the mark-sense sheet.
7. Fill in your name and your instructor's name on the question sheets above.
8. 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 on the question sheets.
9. Turn in both the mark-sense sheets and the question sheets when you are finished.
10. If you finish the exam before 7:20, you may leave the room after turning in the scantron sheet and the exam booklet. If you don't finish before 7:20, you MUST REMAIN SEATED until your TA comes and collects your scantron sheet and your exam booklet.
11. NO CALCULATORS, PHONES, BOOKS, OR PAPERS ARE ALLOWED. Use the back of the test pages for scrap paper.

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. What is the radius of the sphere $x^2 + y^2 + z^2 + 8x - 6y + 14z - 7 = 0$?

A. $\sqrt{5}$

B. $\sqrt{7}$

C. 3

D. 7

E. 9

2. If $\mathbf{a} = \langle 1, -2, 2 \rangle$ and $\mathbf{b} = \langle -3, 0, 4 \rangle$, find $|2\mathbf{b} - 3\mathbf{a}|$.

A. 11

B. 12

C. 13

D. 14

E. 15

3. What is the angle between the vectors $\mathbf{u} = 2\mathbf{i} + 3\mathbf{j} - \mathbf{k}$ and $\mathbf{v} = 5\mathbf{i} + 4\mathbf{j} + \mathbf{k}$?
Potentially useful information: $\sqrt{14}\sqrt{42} = 14\sqrt{3}$

- A. 0
- B. $\pi/6$
- C. $\pi/3$
- D. $2\pi/3$
- E. $5\pi/6$

4. Consider the following vectors and statements:

$$\mathbf{a} = \mathbf{i} + \mathbf{k}, \quad \mathbf{b} = 2\mathbf{i} + 5\mathbf{j} - 2\mathbf{k}, \quad \mathbf{c} = -2\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$$

- I. \mathbf{a} and \mathbf{b} are orthogonal.
- II. \mathbf{a} and \mathbf{c} are orthogonal.
- III. \mathbf{b} and \mathbf{c} are orthogonal.

Choose ALL of the correct statements.

- A. II
- B. I, II
- C. I, III
- D. II, III
- E. I, II, III

5. Find the area of the parallelogram with vertices

$$A(-7, -5), \quad B(-3, 7), \quad C(7, 14), \quad D(3, 2).$$

- A. 28
- B. 92
- C. 120
- D. 124
- E. 148

6. Which of the following is orthogonal to the plane through the points

$$P(2, -1, 2), \quad Q(-1, 2, -3), \quad R(3, 4, -1)?$$

- A. $\langle -3, 3, 5 \rangle$
- B. $\langle 1, 5, -3 \rangle$
- C. $\langle 4, 1, 6 \rangle$
- D. $\langle 5, 6, -9 \rangle$
- E. $\langle 8, -7, -9 \rangle$

7. Find the area of the region bounded by $y = \cos x$, $y = \sin 2x$, $x = 0$, and $x = \frac{\pi}{2}$. You may need to use the double-angle identity $\sin 2\theta = 2 \sin \theta \cos \theta$

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

8. If the disk/washer method is used to find the volume generated by rotating the region bounded by the curves

$$y = x^4, \quad x = y^4$$

about the x -axis, which of the following integrals is correct?

- A. $2\pi \int_0^1 (y^4 - y^{1/4}) dy$
- B. $2\pi \int_0^1 (y^{1/4} - y^4) dy$
- C. $\pi \int_0^1 (x^8 - x^{1/2}) dx$
- D. $\pi \int_0^1 (x^{1/2} - x^8) dx$
- E. $\pi \int_0^1 (y^{1/2} - y^8) dy$

9. The height of a monument is 3 meters. A horizontal cross-section at a distance x meters from the top is an equilateral triangle with each side being $2x$ meters. Find the volume (in m^3) of the monument.

- A. $\frac{3\sqrt{3}}{2}$
- B. $\sqrt{3}$
- C. $9\sqrt{3}$
- D. 18
- E. 36

10. Find the volume of the solid generated by revolving the region bounded by $y = x^2$, $y = 0$, $x = 1$, and $x = 2$ about the line $x = 1$.

- A. $\frac{17\pi}{6}$
- B. $\frac{15\pi}{4}$
- C. $\frac{34\pi}{3}$
- D. $\left(\frac{128}{7} - \frac{32}{5}\right)\pi$
- E. $\left(\frac{256}{7} - \frac{64}{5}\right)\pi$

11. A spring has a natural length of 5 m. If a 25-N force is required to keep it stretched to a length of 10 m, how much work (in joules) is required to stretch it from 5 m to 6 m?

A. $\frac{55}{2}$

B. $\frac{55}{4}$

C. $\frac{5}{4}$

D. $\frac{5}{2}$

E. 5

12. A metal rod is 4 m long. The temperature (in °C) is $3x$ at a distance x m from the left end of the rod (where $x = 0$). What is the average temperature (in °C) of rod?

A. 6

B. 22

C. 24

D. 34

E. 46