MA 16600
EXAM 1 INSTRUCTIONS
Version 11
February 9, 2022

Your Name _____ Your TA's Name _____

PUID # _____ Recitation # 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 Verson 11 on the top. Write 11 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below.

3. On the scantron sheet, fill in your **TA's name (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 **RECITATION SECTION NUMBER**. Your number is a three-digit number. Put a 0 in the front to make it a four-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 you 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 worth 8 points. The maximum possible score is:

$$(12 \times 8) + 4(\text{for taking the exam}) = 100$$

9. NO calculators, electronic devices, books, or papers are allowed. Use the back of the test for scratch paper.

10. After you finish the exam, turn in BOTH the scantron sheet and the exam booklet.

11. If you finish the exam before 7:20pm , you may leave the room after turning in the scantron sheet and the exam booklet. If you don't finish before 7:20pm , 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 the TAs' seating instructions.

2. Students may not open the exam until instructed to do so.

3. No student may leave in the first 20 minutes or the last 10 minutes of the exam.

4. Students that arrive more than 20 minutes late 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 must put down all writing instruments and remain in their seats, while the TAs will collect the scantron sheet and the exam booklet.

6. Any violation of the above rules may result in a score of zero.

Rules Regarding Academic Dishonesty

1. You are not allowed to seek or obtain any kind of help from anyone or 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 exam room.

3. You may not consult notes, books, calculators. You may not handle cell phones, cameras, smart watches, or any electronic devices until after you have finished your exam, handed it in to your instructor and left the exam 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 rules stated above:

STUDENT NAME _____

STUDENT SIGNATURE _____

1. The equation of a plane is given by:

$$7(x - 3) + 2(y - 1) - 3(z + 1) = 0$$

Which of the following vectors is parallel to the plane?

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

B. $\langle 1, -3, 0 \rangle$

C. None of these are parallel to the plane.

D. $\langle 0, 3, 2 \rangle$

E. $\langle 0, 1, 1 \rangle$

2. Consider the sphere given by the equation:

$$x^2 - 10x + y^2 - 2y + z^2 + 2z = a$$

Find the value of a such that the sphere has radius 2.

     A. -5

     B. -23

     C. -3

     D. -17

     E. -25

3. Find the value of a such that the vectors $\mathbf{u} = \langle 3, a, 1 \rangle$ and $\mathbf{v} = \langle -1, 5, a \rangle$ are perpendicular.

    A. $a = -\dfrac{1}{2}$

    B. $a = 1$

    C. $a = 2$

    D. $a = \dfrac{1}{2}$

    E. $a = -2$

4. Find the $\text{Proj}_\mathbf{v}(\mathbf{u})$ where $\mathbf{u} = \langle 1, 1, 2 \rangle$ and $\mathbf{v} = \langle 2, 1, -2 \rangle$.

A. $\dfrac{1}{9}\mathbf{v}$

B. $-\dfrac{1}{6}\mathbf{u}$

C. $\dfrac{1}{6}\mathbf{v}$

D. $-\dfrac{1}{9}\mathbf{u}$

E. $-\dfrac{1}{9}\mathbf{v}$

5. Let $\mathbf{w} = \langle x, y, z \rangle$ be a unit vector that is perpendicular to the vectors $\mathbf{u} = \langle 1, 1, 2 \rangle$ and $\mathbf{v} = \langle 1, -1, 2 \rangle$. Which of the following is a possible value of z?

   A. $\dfrac{\sqrt{5}}{5}$

   B. 0

   C. -2

   D. 4

   E. $\dfrac{2\sqrt{5}}{5}$

6. The area of the triangle with vertices $(1, 1, 1)$, $(2, 1, 3)$, and $(\frac{5}{2}, 2, 2)$ is:

    A. $\sqrt{6}$

    B. $\dfrac{3}{2}$

    C. $\dfrac{\sqrt{2}}{4}$

    D. 3

    E. $\dfrac{\sqrt{6}}{2}$

7. Find the area enclosed by the curves $y = \sin(x)$ and $y = \sin\left(\frac{x}{2}\right)$, $0 \le x \le \frac{2\pi}{3}$.

     A. $-\dfrac{1}{2}$

     B. 1

     C. 2

     D. $\dfrac{1}{2}$

     E. $\dfrac{3}{2}$

8. Consider the region enclosed by the graphs of the functions $y = x$ and $y = x^3$ between $x = 0$ and $x = 1$. Find the volume of the solid obtained by rotating the region about the line $y = -2$ using the disk/washers method.

A. $\dfrac{\pi}{7}$

B. $\dfrac{17\pi}{21}$

C. $\dfrac{25\pi}{21}$

D. $\dfrac{\pi}{3}$

E. $\dfrac{4\pi}{21}$

9. Consider the region enclosed by the graph of the function $y = \sqrt{x} - x^2$ and the x-axis. Find the volume of the solid obtained by rotating the region about the y-axis using the cylindrical shells method.

     A. $\dfrac{9\pi}{70}$

     B. $\dfrac{3\pi}{20}$

     C. $\dfrac{13\pi}{10}$

     D. $\dfrac{2\pi}{3}$

     E. $\dfrac{3\pi}{10}$

10. Compute the volume of the solid obtained from rotating the region bounded by $y = 1$, and $y = x^3$ about the y-axis.

    A. $\dfrac{4\pi}{3}$

    B. $\dfrac{3\pi}{5}$

    C. $\dfrac{6\pi}{7}$

    D. $\dfrac{3\pi}{4}$

    E. $\dfrac{2\pi}{5}$

11. Find the length of the curve

$$y = f(x) = \frac{2}{3}(x+2)^{\frac{3}{2}}$$

on the interval $[1, 6]$.

A. $\dfrac{38}{3}$

B. $\dfrac{19}{3}$

C. $\dfrac{57}{2}$

D. $\dfrac{21}{2}$

E. $\dfrac{16}{3}$

12. The work needed to stretch a spring from its equilibrium length of 1 m to a length of 2 m is 6 J. How much work is needed to stretch the spring from a length of 2.5 m to a length of 3.5 m ?

    A. 24 J

    B. 3 J

    C. 12 J

    D. 6 J

    E. 18 J