MA 26100
EXAM 1 Form A
September 29, 2016

NAME _____ YOUR TA'S NAME _____

STUDENT ID # _____ RECITATION TIME _____

1. You must use a #2 pencil on the mark–sense sheet (answer sheet).

2. On the scantron, write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below.

3. On the scantron, 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. BE SURE TO INCLUDE THE TWO LEADING ZEROS.

5. Fill in your four-digit SECTION NUMBER. If you do not know your section number, please ask your TA.

6. Sign the scantron.

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 scantron and the exam booklet when you are finished.

10. You cannot turn in your exam during the first 20 min or the last 10 min of the exam period.

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 be put away and should not be visible at all. 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. Find an equation of the plane containing the points $P(1, 0, 0), Q(3, 2, 0), R(0, 2, 1)$

   A. $5x - 2y + z = 5$

   B. $x - y + 3z = 1$

   C. $-x + 3z = -1$

   D. $x - 7y + 4z = 1$

   E. $2x + 3y + 7z = 2$

2. What is the angle, in radians, between the planes $3x - 3z = 1$ and $x - y = 5$?
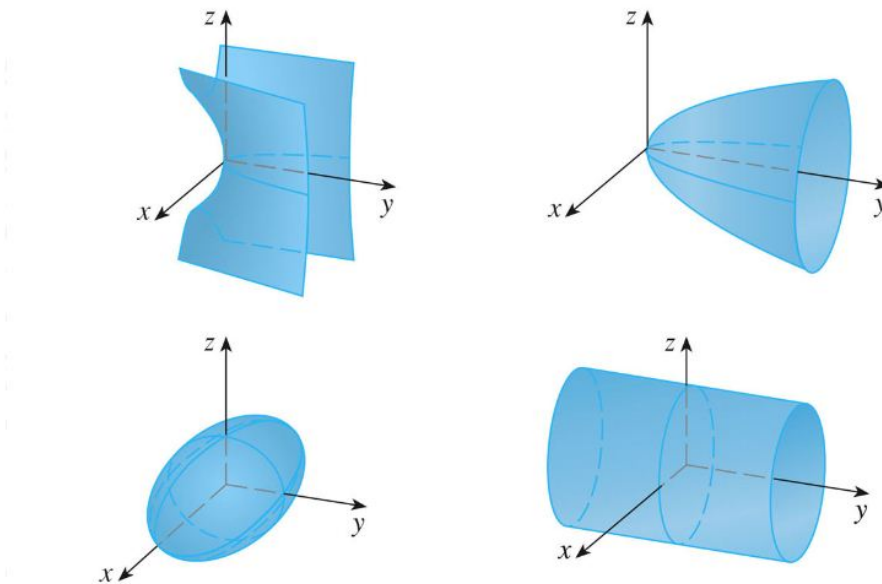
   A. 0

   B. $\dfrac{\pi}{6}$

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

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

   E. $\dfrac{5\pi}{6}$

3. Which of the following equations produces a surface that is NOT shown here?

A. $y = x^2 - z^2$

B. $y = 2x^2 + z^2$

C. $x^2 + 4y^2 + 9z^2 = 1$

D. $x^2 + 2z^2 = 1$

E. $-x^2 + y^2 - z^2 = 1$

4. Let (a, b, c) be the point of intersection of the space curve $\vec{r}(t) = <\sqrt{2}t, t^2 + 1, 1 - 4t>$ with the surface $x^2 + 2y - z = 0$. What is the value of $a^2 + 2b$?

A. 3

B. 4

C. 5

D. 6

E. 7

5. Find the length of the curve $\vec{r}(t) = <t - \sin t, 1 - \cos t >$ on $0 \le t \le \pi$. (Hint: use the double-angle formula $\cos(2x) = 1 - 2\sin^2 x$.)

    A. 4

    B. 8

    C. -4

    D. -5

    E. 2π

6. The curvature of the curve $\vec{r}(t) = <9\cos t, 9\sin t>$ at $t = \pi$ is

    A. 9

    B. 3

    C. $\dfrac{1}{9}$

    D. $\dfrac{1}{3}$

    E. 1

7. If a particle has the given acceleration $\vec{a}(t) \ =< 2, -\cos t, \dfrac{3}{4\sqrt{t}} >$ with initial position $\vec{r}(0) =< 0,1,1 >$ and initial velocity $\vec{v}(0) =< 1,0,0 >$, then its position at $t = \pi$ is

A. $< \pi^2 + \pi, -1, \pi^{3/2} + 1 >$

B. $< \pi^2 + \pi, -1, \pi^{3/2} >$

C. $< \pi^2, -1, \pi^{3/2} + 1 >$

D. $< \pi^2 + \pi, 1, \pi^{3/2} + 1 >$

E. $< \pi^2, 1, \pi^{3/2} + 1 >$

8. Consider the function $f(x,y) = \dfrac{2 + xy^3}{1 + x^2 - y^2}$ on its maximal domain of definition. Calculate $\displaystyle \lim_{(x,y) \to (0,0)} f(x,y)$

A. This limit does not exist.

B. This limit in not well defined, since the function is not defined at $(0,0)$

C. 0

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

E. 2

9. Let $P = \sqrt{u^2 + v^2 + w^2}$, $u = u(x,y)$, $v = v(x,y)$, and $w = w(x,y)$. If $u(0,1) = 0$, $u_x(0,1) = 2$, $w(0,1) = 2$, $w_x(0,1) = 0$, and $v(x,y) = ye^x$. Find $P_x(0,1)$.

A. $2 \cdot 5^{-1/2}$

B. $2 \cdot 5^{1/2}$

C. $5^{1/2}$

D. $5^{-1/2}$

E. $4 \cdot 5^{1/2}$

10. The total surface area of a cone having height h and a base radius r is

$$A = \pi r \sqrt{r^2 + h^2} + \pi r^2.$$

If r and h are measured as 3 in and 4 in, respectively, with an error in measurement of at most 1 in each, use differentials to estimate the maximum error (in in^2) in the calculated surface area.

A. 2.4π

B. 12.8π

C. 15.2π

D. 7.6π

E. 3.8π

11. Let $R(p, q) = \tan^{-1}(pq^2)$. Find $\dfrac{\partial^2 R}{\partial q \partial p}$.

A. $\dfrac{2q}{(1 - p^2 q^4)^{3/2}}$

B. $\dfrac{2q - 2q^5 p^2}{(1 + p^2 q^4)^2}$

C. $\dfrac{q}{(1 - p^2 q^4)^{3/2}}$

D. $\dfrac{2q}{(1 + p^2 q^4)^2}$

E. $\dfrac{q^2}{(1 - p^2 q^4)^{3/2}}$

12. Find the directional derivative for $T(x, y) = \dfrac{y - 1}{x - 2}$ at $(3, -2)$ in the direction toward the origin.

A. 7

B. -7

C. $\dfrac{7}{\sqrt{13}}$

D. $\dfrac{-7}{\sqrt{13}}$

E. 5