MA 26100
EXAM 1 Form 01
February 19, 2019

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 7:20, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 6:50. 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.

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 line l passes through the point $(-1, 1, 2)$ and is perpendicular to the plane $x - 2y + 2z = 8$. At what point does this line intersect with the yz-plane?

A. (0, 4, 6)

B. (0, 3, 1)

C. (0, 4, −1)

D. (0, 1, 4)

E. (0, −1, 4).

2. Find the equation of the plane that passes through the point (1, −1, 2) and is perpendicular to both the planes $2x + y - 2z = 1$ and $x + 3z = 10$.

A. $3x + 8y - z = -7$

B. $3x - 8y - z = 9$

C. $3x - 8y + z = 13$

D. $3x - 8y - z = 13$

E. $3x - y + z = 10$

3. Find a vector function that represents the curve of intersection of the cylinder $y^2 + z^2 = 1$ and the plane $x + y + 2z = 3$.

A. $\mathbf{r}(t) =< 3 - \cos t - \sin t,\ \cos t,\ \sin t >, \quad 0 \leq t \leq 2\pi$

B. $\mathbf{r}(t) =< 3 - \cos t - 2\sin t,\ \cos t,\ \sin t >, \quad 0 \leq t \leq 2\pi$

C. $\mathbf{r}(t) =< 1 - \cos t - 2\sin t,\ \cos t,\ \sin t >, \quad 0 \leq t \leq 2\pi$

D. $\mathbf{r}(t) =< 3 - \cos t - \sin t,\ 2\cos t,\ \sin t >, \quad 0 \leq t \leq 2\pi$

E. $\mathbf{r}(t) =< 3 - \cos t - 2\sin t,\ \cos t,\ 2\sin t >, \quad 0 \leq t \leq 2\pi$

4. Let $\mathbf{r}(t) =< t,\ \frac{1}{2}t^2,\ \frac{1}{3}t^3 >$, find $\kappa(1)$ (namely, the curvature at t=1).

A. 1

B. $\frac{1}{3}$

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

D. $\frac{-1}{3}$

E. $\frac{\sqrt{3}}{3}$

5. A particle travels with position vector $\mathbf{r}(t) = \langle 3t,\ 4\sin t,\ 4\cos t\rangle$, $t \geq 0$. Find $\alpha \geq 0$ such that during the interval of time from 0 to α the particle has traveled a distance 20.

A. 1

B. 2

C. 3

D. 4

E. 5

6. A particle has acceleration $\mathbf{a} = \langle 6t - 2,\ -1/t^2,\ 0\rangle$. It is known that the velocity at time $t = 1$ is $\mathbf{v}(1) = \langle 1, 1, 1\rangle$ and that the position vector at time $t = 1$ is $\mathbf{r}(1) = \langle 0, 0, 3\rangle$. Find the magnitude of the position vector at time $t = 2$.

A. $\sqrt{16 + \ln 4}$

B. $\sqrt{16 + (\ln 2)^2}$

C. $\sqrt{32 + (\ln 2)^2}$

D. 4

E. $\sqrt{32 + (\ln 4)^2}$

7. The level curves of $f(x,y) = \sqrt{x^2+1} - 2y$ are

A. hyperbolas

B. ellipses

C. sometimes lines and sometimes parabolas

D. sometimes parabolas and sometimes hyperbolas

E. parabolas

8. If $f(x,y,z) = \dfrac{xz}{\sqrt{y^2-z}}$, then $f_{xyz}(1,2,3)$ is equal to

A. -15

B. -11

C. -9

D. -18

E. -12

9. Let $z = e^r \cos\theta$, $r = 12st$, $\theta = \sqrt{s^2+t^2}$. The partial derivative $\dfrac{\partial z}{\partial s}$ is:

A. $e^r\left(12t\cos\theta - \dfrac{s\sin\theta}{\sqrt{s^2+t^2}}\right)$

B. $e^r\left(t\cos\theta - \dfrac{s\sin\theta}{\sqrt{s^2+t^2}}\right)$

C. $e^r\left(12t\cos\theta + \dfrac{s\sin\theta}{\sqrt{s^2+t^2}}\right)$

D. $e^r\left(t\cos\theta + \dfrac{s\sin\theta}{\sqrt{s^2+t^2}}\right)$

E. $12t\cos\theta - \dfrac{se^r\sin\theta}{\sqrt{s^2+t^2}}$

10. The direction in which $f(x,y) = x^2y + e^{xy}\sin y + 15$ increases most rapidly at $(1,0)$ is:
(Note: Give your answer in the form of a unit vector.)

A. $\mathbf{i}$

B. $\mathbf{j}$

C. $\dfrac{1}{\sqrt{2}}\,\mathbf{i} + \dfrac{1}{\sqrt{2}}\,\mathbf{j}$

D. $\dfrac{1}{\sqrt{5}}\,\mathbf{i} + \dfrac{2}{\sqrt{5}}\,\mathbf{j}$

E. $\dfrac{2}{\sqrt{13}}\,\mathbf{i} + \dfrac{3}{\sqrt{13}}\,\mathbf{j}$

11. The equation of the tangent plane to the graph of the function $f(x, y) = x - \frac{y^2}{2}$ at $(2, 4, -6)$ is:

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

B. $x + 4y = 18$

C. $x - 4y - z = -4$

D. $-x + 4y + z = 8$

E. $x - y - 2z = 10$

12. The function $f(x, y) = 6x^2 + 3y^2 - 16$ attains its local minimum at:

A. $(6, 3)$

B. $(3, 0)$

C. $(0, 0)$

D. $(6, 0)$

E. $(6, -3)$