MA 26100
EXAM 2
04/08/2025
TEST/QUIZ NUMBER: **9955**

NAME ______________________ YOUR TA'S NAME ______________________

STUDENT ID # ____________________ RECITATION TIME ____________________

You must use a #2 pencil on the scantron sheet. Write **9955** in the TEST/QUIZ NUMBER boxes and blacken in the appropriate digits below the boxes. On the scantron sheet, fill in your **TA**'s name for the INSTRUCTOR and **MA 261** for the COURSE number. Fill in whatever fits for your first and last NAME. The STUDENT IDENTIFICATION NUMBER has ten boxes, so use **00** in the first two boxes and your PUID in the remaining eight boxes. Fill in your three-digit SECTION NUMBER. If you do not know your section number, ask your TA. Complete the signature line.

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 in this exam booklet and indicate your answers in the booklet in case the scantron is lost. Use the back of the test pages for scrap paper. Turn in both the scantron sheet 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. Find the volume of the region *in the first octant* that lies inside $x^2 + y^2 + z^2 = 9$ and above the cone $z = \sqrt{x^2 + y^2}$.

A. 18π

B. $9\pi\sqrt{2}$

C. $3\pi^2/8$

D. $9\pi^2/16$

E. $\frac{9}{2}\pi\left(1 - \frac{1}{\sqrt{2}}\right)$

F. $9\pi/2$

2. Find

$$\int_C \frac{\sqrt[5]{xyz}}{\sqrt{1+8y}}\, ds$$

where C is $\vec{\boldsymbol{r}}(t) = t\vec{\boldsymbol{\imath}} + t^2\vec{\boldsymbol{\jmath}} + t^2\vec{\boldsymbol{k}}$ for $0 \le t \le 1$.

A. $\frac{4}{3}$

B. $\frac{13}{12}$

C. $\frac{1+\sqrt{5}}{2}$

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

E. $\frac{3\sqrt{5}-1}{8}$

F. $\frac{1}{2}$

3. Compute the double integral $\iint\limits_R \frac{3xy^2}{1+x^2}\,dA$ where R is the rectangle $R = \{(x,y) : 0 \le x \le 1,\ -2 \le y \le 2\}$

A. 0

B. $4\ln 2$

C. 2π

D. $8\ln 2$

E. 4π

F. $2\pi \ln 2$

4. Use Green's Theorem to evaluate $\int\limits_C 2xy\ dx\ +\ y^2\ dy$ where C is the boundary of the rectangle with vertices $(0,0)$, $(1,0)$, $(1,3)$, and $(0,3)$, oriented counterclockwise.

A. 0

B. -3

C. -9

D. 6

E. -27

F. 12

5. Let D be the region between $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$ which is above $z = 0$ and below $z = 4 - (x^2 + y^2)$. Using cylindrical coordinates, if $f(r, \theta, z) = \dfrac{1}{r^3}$ then the value of $\displaystyle\int_D f \, dV$ is:

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

B. 0

C. $\pi(3 - \ln 4)$

D. $\dfrac{9\pi}{8}$

E. 2π

F. $\pi\left(\dfrac{15}{4} - \ln 16\right)$

6. Consider the following triple integral.

$$\int_0^2 \int_x^2 \int_{2y}^4 f(x, y, z) \, dz \, dy \, dx.$$

Which of the following is the correct way to re-write the integral with respect to the order of integration $\iiint f(x, y, z) \, dx \, dz \, dy$?

A. $\int_0^2 \int_{2y}^4 \int_y^2 f(x, y, z) \, dx \, dz \, dy$

B. $\int_x^{z/2} \int_{2x}^4 \int_0^2 f(x, y, z) \, dx \, dz \, dy$

C. $\int_0^2 \int_0^{2y} \int_0^y f(x, y, z) \, dx \, dz \, dy$

D. $\int_x^2 \int_{2y}^4 \int_0^2 f(x, y, z) \, dx \, dz \, dy$

E. $\int_0^2 \int_{2y}^4 \int_0^x f(x, y, z) \, dx \, dz \, dy$

F. $\int_0^2 \int_{2y}^4 \int_0^y f(x, y, z) \, dx \, dz \, dy$

7. If $\nabla\varphi = \langle 2x, -2y\rangle$ then the equipotential curves (level curves of φ) are mostly

A. Lines

B. Isolated points

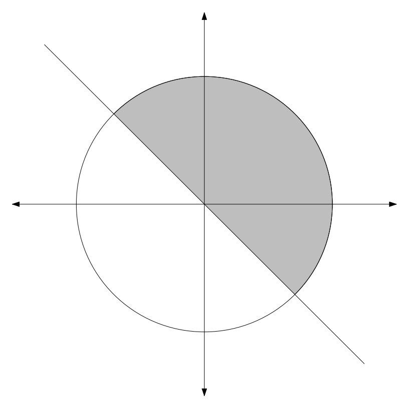
C. Non-circular ellipses

D. Hyperbolas

E. Circles

F. Parabolas

8.



Compute the double integral $\displaystyle\iint_R x\, dA$ where R is the region in the plane inside of the circle $x^2 + y^2 = 4$ and above the line $y = -x$.

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

B. $\dfrac{8\sqrt{2}}{3}$

C. $2\sqrt{2}$

D. $\dfrac{8}{3}$

E. $\dfrac{8}{\sqrt{3}}$

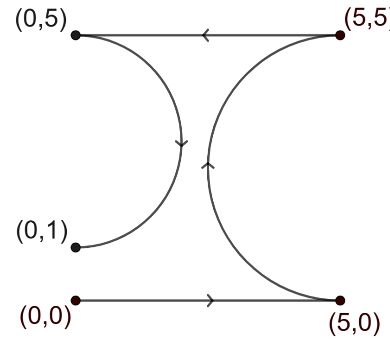
F. 0

9.

Find

$$\int_C \vec{\boldsymbol{F}} \cdot d\vec{\boldsymbol{r}}$$

where $\vec{\boldsymbol{F}}(x,y) = \langle -e^y \sin x,\ e^y \cos x \rangle$ and the curve C is the pictured path (a sequence of directed line segments and semicircles) from $(0,0)$ to $(0,1)$.



A. $e - 1$

B. $1 - e$

C. $e + 1$

D. 0

E. $-e$

F. e

10. Find

$$\int_C \vec{\boldsymbol{F}} \cdot \vec{\boldsymbol{T}}\, ds$$

where $\vec{\boldsymbol{F}}(x,y) = -y\vec{\boldsymbol{\imath}} + x\vec{\boldsymbol{\jmath}}$ and C is the circle of radius 1, centered at the origin and oriented counterclockwise.

A. 1

B. π

C. $\pi/2$

D. 4π

E. 0

F. 2π

11. Compute the double integral $\displaystyle\iint_{◤} \frac{1}{x\ln(y)}\,dA$ where ◤ is the triangle with vertices $(1,1)$, $(1,3)$, and $(3,3)$. *Hint: the integral is easier with one order of integration than the other.*

A. $\dfrac{2}{\ln(2)}$

B. 2

C. 0

D. 1

E. $\ln 3$

F. $3\ln 3$

12. Compute the **absolute maximum** of the function $f(x,y,z) = 2x + 2y - z$ over the sphere $x^2 + y^2 + z^2 = 9$.

A. $5\sqrt{3}$

B. 9

C. $6\sqrt{2}$

D. $6\sqrt{3}$

E. 7

F. 10