MA 26100
EXAM 2
04/05/2022
TEST/QUIZ NUMBER: **1010**

NAME ____________________ YOUR TA'S NAME ____________________

STUDENT ID # ____________________ RECITATION TIME ____________________

You must use a #2 pencil on the scantron sheet. Write **1010** 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 8:50, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 8:20. If you don't finish before 8:50, 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 cube is given by the region $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$, and has density function $\delta = x + yz$. Find the x-coordinate for the cube's center of mass, given that $\displaystyle\iiint\limits_{\text{cube}} \delta \, dV = \frac{3}{4}$.

A. $\overline{x} = \dfrac{7}{12}$

B. $\overline{x} = \dfrac{2}{3}$

C. $\overline{x} = \dfrac{1}{2}$

D. $\overline{x} = \dfrac{5}{9}$

E. $\overline{x} = \dfrac{11}{18}$

F. $\overline{x} = \dfrac{9}{16}$

2. A helix curve, C, is parametrized by $\vec{\boldsymbol{r}}(t) = \langle \cos t, \sin t, t \rangle$, for $0 \leq t \leq \dfrac{\pi}{2}$.
Compute the line integral

$$\int\limits_C xy \, ds$$

A. $\sqrt{2}$

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

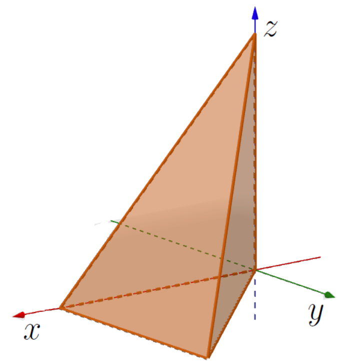
C. 0

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

E. π

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

3. Five of these six triple integrals are over the same region of space: the tetrahedron pictured below with vertices at $(0,0,0)$, $(0,0,1)$, $(1,0,0)$ and $(1,1,0)$. One of these triple integrals is over a different region. Which one is different?



A. $\displaystyle\int_0^1 \int_0^{1-z} \int_y^{1-z} f(x,y,z)\ dx\, dy\, dz$

B. $\displaystyle\int_0^1 \int_0^{1-x} \int_0^{x} f(x,y,z)\ dy\, dz\, dx$

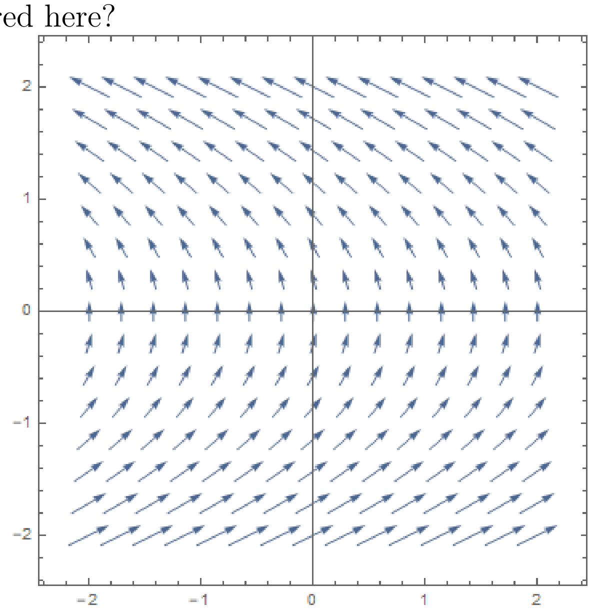
C. $\displaystyle\int_0^1 \int_0^{1-z} \int_0^{x} f(x,y,z)\ dy\, dx\, dz$

D. $\displaystyle\int_0^1 \int_0^{y} \int_0^{1-x} f(x,y,z)\ dz\, dx\, dy$

E. $\displaystyle\int_0^1 \int_0^{1-y} \int_y^{1-z} f(x,y,z)\ dx\, dz\, dy$

F. $\displaystyle\int_0^1 \int_0^{x} \int_0^{1-x} f(x,y,z)\ dz\, dy\, dx$

4. Which vector field corresponds to the one pictured here?



A. $\vec{\boldsymbol{F}}(x,y) = \langle 1, -y \rangle$

B. $\vec{\boldsymbol{F}}(x,y) = \langle -x, y \rangle$

C. $\vec{\boldsymbol{F}}(x,y) = \langle -y, x \rangle$

D. $\vec{\boldsymbol{F}}(x,y) = \langle 1, y \rangle$

E. $\vec{\boldsymbol{F}}(x,y) = \langle y, 1 \rangle$

F. $\vec{\boldsymbol{F}}(x,y) = \langle -y, 1 \rangle$

5. Find $\int_C \vec{\boldsymbol{F}} \cdot \vec{\boldsymbol{T}}\, ds$, where $\vec{\boldsymbol{F}}(x,y,z) = \langle ye^z, e^y + xe^z, xye^z \rangle$ on some smooth oriented curve C that goes from $(0,0,0)$ to $(-1,1,1)$.

A. e

B. -1

C. 0

D. $-e$

E. 1

F. Impossible to answer without knowing C.

6. Choose the triple integral in spherical coordinates that represents the volume of the solid bounded by the cone $z^2 = x^2 + y^2$ and lying between the planes $z = 1$ and $z = 2$. You do not need to compute the volume.

A. $\displaystyle\int_0^{2\pi} \int_1^{2\sqrt{2}} \int_0^{\pi/4} \rho^2 \sin\phi \; d\phi \; d\rho \; d\theta$

B. $\displaystyle\int_0^{2\pi} \int_0^{\pi/4} \int_{\sec\phi}^{2\sec\phi} d\rho \; d\phi \; d\theta$

C. $\displaystyle\int_0^{2\pi} \int_1^{2} \int_0^{\pi/4} d\phi \; d\rho \; d\theta$

D. $\displaystyle\int_0^{2\pi} \int_0^{\pi/4} \int_{\sec\phi}^{2\sec\phi} \rho^2 \sin\phi \; d\rho \; d\phi \; d\theta$

E. $\displaystyle\int_0^{2\pi} \int_1^{2} \int_0^{\pi/4} \rho^2 \sin\phi \; d\phi \; d\rho \; d\theta$

F. $\displaystyle\int_0^{2\pi} \int_1^{2\sqrt{2}} \int_0^{\pi/4} d\phi \; d\rho \; d\theta$

7. Find the absolute maximum value, M, and the absolute minimum value, m, of the function $f(x, y) = x + y$ subject to the constraint $x^2 - xy + y^2 = 1$.

A. $M = 2$ and $m = -2$

B. $M = 1$ and $m = -1$

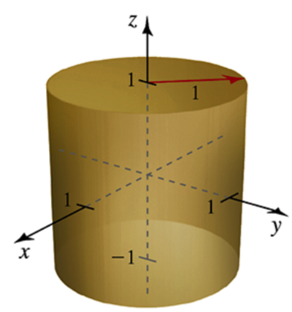
C. $M = 1$ and $m = -4$

D. $M = 2$ and $m = -1$

E. $M = 4$ and $m = -2$

F. $M = 4$ and $m = -4$

8. $\displaystyle\int_{-1}^{1} \int_{-\sqrt{1-y^2}}^{\sqrt{1-y^2}} \int_{-1}^{1} (x^2 + y^2)^{3/2} \, dz \, dx \, dy$



A. $\dfrac{2\pi}{7}$

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

C. $\dfrac{4\pi}{5}$

D. $\dfrac{4\pi}{7}$

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

F. π

9. $\displaystyle\int_0^{\sqrt{\pi}} \int_0^{\sqrt{\pi - y^2}} \sin(x^2 + y^2)\ \ dx\ dy$

Hint: polar

A. $\dfrac{\pi}{8}$

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

C. $\dfrac{\pi}{4}$

D. π

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

F. $\dfrac{\pi}{2}$

10. Change the order of integration for the double integral $\displaystyle\int_0^2 \int_{x^2}^{2x} f(x, y)\ dy\ dx$. You do not need to compute the integral.

A. $\displaystyle\int_0^4 \int_{\sqrt{y}}^{y/2} f(x, y)\ dx\ dy$

B. $\displaystyle\int_0^2 \int_{\sqrt{y}}^{y/2} f(x, y)\ dx\ dy$

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

D. $\displaystyle\int_0^2 \int_{y/2}^{\sqrt{y}} f(x, y)\ dx\ dy$

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

F. $\displaystyle\int_0^4 \int_{y/2}^{\sqrt{y}} f(x, y)\ dx\ dy$

11. Given the force field $\vec{\boldsymbol{F}}(x,y,z) = \langle y, z, x \rangle$, find the work required to move an object along the straight line segment from $(0,0,0)$ to $(2,3,4)$.

A. 13

B. 9

C. 29

D. 26

E. 18

F. $\dfrac{29}{2}$

12. Use Green's Theorem to evaluate $\displaystyle\int_C x\,dx \;+\; (x^2+y^2)\,dy$ where C is the boundary of the rectangle with vertices $(0,0)$, $(2,0)$, $(2,3)$, and $(0,3)$, oriented counterclockwise.

A. 4

B. 24

C. 12

D. 16

E. 6

F. 8