MA 26100
Exam 2
11/07/2023
TEST/QUIZ NUMBER:
5555

NAME ______________________ YOUR TA'S NAME ______________________

STUDENT ID # ____________________ RECITATION # ____________________

You must use a #2 pencil on the scantron answer sheet. Fill in the following on your scantron and blacken the bubbles

1. Your name. If there aren't enough spaces for your name, fill in as much as you can.
2. Your 3-digit recitation section number, e.g. **XYZ**. (If you don't know your recitation section number, ask your TA.)
3. Test/Quiz number: **5555**
4. Student Identification Number: **This is your Purdue ID number with two leading zeros**
5. Blacken in your choice of the correct answer on the scantron answer sheet for questions 1–12.

There are **12** questions, each worth 8 points (you will earn 4 points for filling out your scantron correctly). 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 8:50pm, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 8:20pm. If you don't finish before 8:50pm, 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 booklet 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, phone, 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, students must 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 SIGNATURE: ________________________________

1. Evaluate

$$\int_0^3 \int_0^{\sqrt{9-x^2}} \sqrt{x^2+y^2}\, dy\, dx$$

by converting to polar coordinates.

A. 3π

B. 18π

C. $\frac{9\pi}{4}$

D. 9π

E. $\frac{9\pi}{2}$

2. Find the center of mass of the rectangle $\{(x, y) \mid 0 \leq x \leq 2,\ 0 \leq y \leq 4\}$ where the density function is given by $\rho(x, y) = 1 + y$.

A. $(1, 2)$

B. $(0, 5)$

C. $\left(1, \dfrac{22}{9}\right)$

D. $\left(1, \dfrac{11}{3}\right)$

E. $(1, 3)$

3. Rewrite the triple integral $\int_2^6 \int_0^{\sqrt{2}} \int_x^{\sqrt{4-x^2}} e^{-x^2-y^2}\, dy\, dx\, dz$ in Cylindrical coordinates.

A. $\int_2^6 \int_0^{\frac{\pi}{4}} \int_0^2 e^{-r^2}\, dr\, d\theta\, dz$

B. $\int_2^6 \int_0^{2\pi} \int_0^2 re^{-r^2}\, dr\, d\theta\, dz$

C. $\int_2^6 \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \int_0^2 e^{-r^2}\, dr\, d\theta\, dz$

D. $\int_2^6 \int_0^{\frac{\pi}{4}} \int_0^2 re^{-r^2}\, dr\, d\theta\, dz$

E. $\int_2^6 \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \int_0^2 re^{-r^2}\, dr\, d\theta\, dz$

4. Find $\int_C \vec{\mathbf{F}} \cdot d\mathbf{r}$, where $\vec{\mathbf{F}}(x, y, z) = \langle 2xy - yz, x^2 - xz, -xy \rangle$ on some smooth curve C that goes from $(2, 1, 0)$ to $(3, 2, -1)$.

A. 20

B. 8

C. 12

D. 24

E. Impossible to answer without knowing C.

5. Given the force field $\vec{\mathbf{F}}(x, y) = \langle -y, x \rangle$, find the work required to move an object along the ellipse $\vec{\mathbf{r}}(t) = \langle 2\cos(t), 3\sin(t) \rangle$ from $(2, 0)$ to $(0, 3)$.

A. 3π

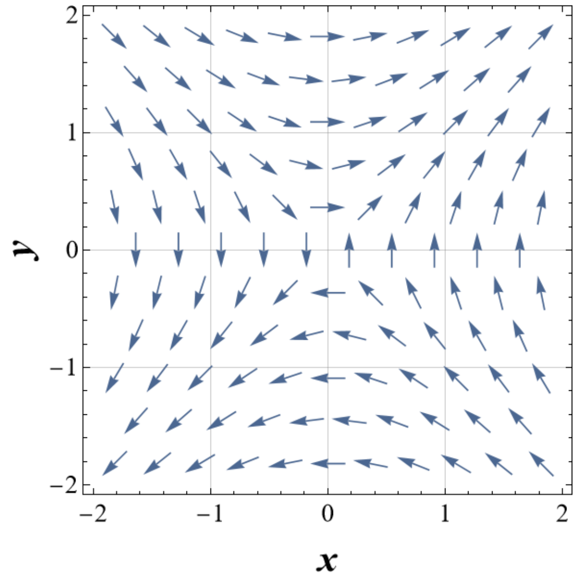
B. 9π

C. 6π

D. 0

E. 2π

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



A. $\vec{\mathbf{F}}(x, y) = \langle x, 5y \rangle$

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

C. $\vec{\mathbf{F}}(x, y) = \langle y, -2 \rangle$

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

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

7. Let E be the solid region in the first octant that is above the xy plane and below the plane $4x + 2y + z = 8$. Then the iterated integral satisfying

$$\iiint_E f(x, y, z)dV = \int_0^a \int_0^b \int_0^c f(x, y, z)\, dz\, dy\, dx$$

must have:

A. $a = 2, b = 4 - 2x$

B. $a = 3, b = 4 - 2x$

C. $a = 3, b = 8 - 4x - 2y$

D. $a = 2, b = 8 - 4x - 2y$

E. $a = 2, b = 8 - 4x - z$

8. Compute the following integral; you may wish to change the order of integration in order to do so:

$$\int_0^{27} \int_{\sqrt[3]{x}}^{3} 4e^{y^4}\, dy dx$$

A. $e - 1$

B. e^{81}

C. $e^{81} - 1$

D. 0

E. $e^{3} - 1$

9. Calculate

$$\int_C \frac{1}{(x-y)^2}ds$$

where C is the straight line segment from $(1,0)$ to $(5,3)$.

A. 5

B. $\frac{2}{5}$

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

D. $\frac{5}{2}$

E. $\frac{15}{2}$

10. Find the maximum value of the function $f(x, y) = 3 + 2x - y$ subject to the constraint $x^2 + 2xy + 4y^2 = 7$.

A. 10

B. 7

C. 14

D. 8

E. 2

11. Choose the triple integral in spherical coordinates that represents the volume of the solid bounded by the cone $z = \sqrt{x^2 + y^2}$ and the sphere $x^2 + y^2 + z^2 = 8$.

A. $\int_0^{2\pi} \int_0^{\frac{\pi}{2}} \int_0^{\sqrt{8}} \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta$

B. $\int_0^{2\pi} \int_0^{\frac{\pi}{4}} \int_0^{\sqrt{8}} \rho \sin^2\phi \, d\rho \, d\phi \, d\theta$

C. $\int_0^{2\pi} \int_0^{\frac{\pi}{4}} \int_0^{\sqrt{8}} \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta$

D. $\int_0^{2\pi} \int_0^{\frac{\pi}{4}} \int_0^{\sqrt{8}} \rho \sin\phi \, d\rho \, d\phi \, d\theta$

E. $\int_0^{2\pi} \int_0^{\frac{\pi}{4}} \int_0^{8} \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta$

12. Find the volume enclosed by the surfaces $x = 0$, $x = 3$, $y = 0$, $y = 2$, $z = 1$ and $z = e^{x+y}$.

A. $e^5 + e^3 - e^2 - 5$

B. 0

C. $e^5 - e^3 - e^2 + 1$

D. $e^5 - e^3 - e^2 - 5$

E. $e^5 - e^2$

(This page left intentionally blank for scratch work.)