MA 26100
Exam 2 - Spring 2024
04/10/2024
TEST/QUIZ NUMBER:

21

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 recitation section number. (If you don't know your recitation section number, ask your TA.)
3. Test/Quiz number: **21**
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. According to Green's Theorem, which of the following line integrals is **NOT** equal to the area of the region enclosed by a simple closed curve C, oriented counter clockwise?

A. $\frac{1}{5}\int_C y\ dx + 6x\ dy$

B. $\frac{1}{5}\int_C -3y\ dx + 2x\ dy$

C. $\frac{1}{5}\int_C -4y\ dx + x\ dy$

D. $\frac{1}{5}\int_C 2y\ dx + 7x\ dy$

E. $\frac{1}{5}\int_C 2y\ dx - 3x\ dy$

2. Given the Force Field $\vec{F} = \langle x, y, z \rangle$, find the work required to move an object on the helix $\vec{r}(t) = \langle 2\cos t, 2\sin t, \frac{t}{2\pi} \rangle, 0 \leq t \leq 2\pi$.

A. $\frac{1}{8\pi^2}$

B. $\frac{1}{2\pi}$

C. $4\pi + \frac{1}{2}$

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

E. $8\pi + \frac{1}{2}$

3. Find volume of the solid region bounded by two surfaces $z = x^2 + y^2 - 9$ and $z = -2(x^2 + y^2)$.
Hint: Use Cylindrical Coordinates

A. $\frac{27\pi}{4}$

B. $\frac{81\pi}{2}$

C. $\frac{27\pi}{2}$

D. $\frac{81\pi}{3}$

E. $\frac{81\pi}{4}$

4. Compute $\int_0^1 \int_0^4 \sqrt{xy}\, dx\, dy$.

A. $\frac{32}{9}$

B. $\frac{64}{9}$

C. $\frac{32}{27}$

D. $\frac{16}{27}$

E. $\frac{16}{9}$

5. Compute $\displaystyle\int_{-3}^{3}\int_{-\sqrt{9-y^2}}^{\sqrt{9-y^2}} e^{x^2+y^2}\,dx\,dy$

A. $\pi(e^9-1)$

B. $\dfrac{\pi}{2}(e^3-1)$

C. $\dfrac{\pi}{2}(e^9-1)$

D. $\pi(e^3-1)$

E. $\dfrac{\pi}{2}(e^6-1)$

6. Which of the following integrals represent volume of the solid in the first octant bounded by the plane $3x + 2y + 6z = 12$.

A. $\displaystyle\int_0^6 \int_0^{4-\frac{2y}{3}} \int_0^{3-\frac{x}{2}-\frac{y}{3}} dz\ dx\ dy.$

B. $\displaystyle\int_0^6 \int_0^{4-\frac{2y}{3}} \int_0^{2-\frac{x}{2}-\frac{y}{3}} dz\ dx\ dy.$

C. $\displaystyle\int_0^4 \int_0^{6-y} \int_0^{2-\frac{x}{2}-\frac{y}{3}} dz\ dx\ dy.$

D. $\displaystyle\int_0^6 \int_0^{4-\frac{y}{3}} \int_0^{2-\frac{x}{3}-\frac{y}{3}} dz\ dx\ dy.$

E. $\displaystyle\int_0^4 \int_0^{6-y} \int_0^{2-\frac{x}{3}-\frac{y}{3}} dz\ dx\ dy.$

7. At which points on the curve $x^2 + y^2 = 4$ does the function $f(x, y) = 4x^2 + 10y^2$ achieve an absolute maximum?

A. $(0, 2)$ and $(0, -2)$

B. $(0, 2)$ only

C. $(2, 0)$ and $(2, 0)$

D. $(2, 0)$ only

E. It does not achieve an absolute maximum

8. Let $f(x,y,z) = x^4 + y^2 + z^5$ and $g(x,y,z) = x^2 + 3y + 2z$. Suppose $\vec{\nabla} f(1,1,-1)$ is perpendicular to $\vec{\nabla} g(a,b,c)$, then

A. $a = -2$

B. $a = 1$

C. $a = 2$

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

E. $a = -1$

9. Given that $\vec{F} = \langle 7 - 4y, 2y - 4x \rangle$ is conservative and $\vec{F} = \vec{\nabla}\phi$. Evaluate $\int_C \vec{\nabla}\phi \cdot d\vec{r}$, where the curve C is parametrized as $\vec{r}(t) = \langle e^t \sin t, e^t \cos t \rangle, 0 \leq t \leq 2\pi$.

A. $e^{2\pi} - 1$

B. $-e^{4\pi} - 1$

C. $4\pi^2$

D. $-4\pi^2$

E. $e^{4\pi} - 1$

10. Suppose $f(x, y, z) = xy^2z^3$, then $\text{div}(\vec{\nabla} f)$ at $(2, -1, 1)$ is equal to:

A. 8

B. 14

C. 16

D. 10

E. 12

11. Find the area of the part of the plane $2x + 5y + z = 10$ that is in the first octant.

A. $\sqrt{30}$
B. $10\sqrt{30}$
C. $5\sqrt{10}$
D. $5\sqrt{30}$
E. $10\sqrt{10}$

12. Compute $\iint_R \cos(y^2)\ dy\ dx$, over the triangle R with vertices $(0,0), (0, \sqrt{\frac{\pi}{2}}), (\sqrt{\frac{\pi}{2}}, \sqrt{\frac{\pi}{2}})$.

A. 1
B. $\frac{1}{2}$
C. $\frac{\pi}{2}$
D. 0
E. $\sqrt{\frac{\pi}{2}}$

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