Practice Exam 3

Name: ______________________ Section and/or TA: ____________

Last Four Digits of Student ID: ________

Do not remove this answer page — you will return the whole exam. You will be allowed two hours to complete this test. No books or notes may be used except for a one-page sheet of formulas and facts. You may use a graphing calculator during the exam, but NO calculator with a Computer Algebra System (CAS) or a QWERTY keyboard is permitted. Absolutely no cell phone use during the exam is allowed.

The exam consists of 10 multiple choice questions and 4 free response questions. Record your answers to the multiple choice questions on this page by filling in the circle corresponding to the correct answer.

Show all work to receive full credit on the free response problems. Unsupported answers on free response problems will receive *no credit*.

Multiple Choice Questions

1 (A) (B) (C) (D) (E)

2 (A) (B) (C) (D) (E)

3 (A) (B) (C) (D) (E)

4 (A) (B) (C) (D) (E)

5 (A) (B) (C) (D) (E)

6 (A) (B) (C) (D) (E)

7 (A) (B) (C) (D) (E)

8 (A) (B) (C) (D) (E)

9 (A) (B) (C) (D) (E)

10 (A) (B) (C) (D) (E)

SCORE

Multiple Choice	11	12	13	14	Total Score
50	10	15	10	15	100

Multiple Choice Questions

1. Find the iterated integral $\int_0^1 \int_0^x \cos(x^2)\, dy\, dx$

   A. $\pi/2$

   B. $\pi/4$

   C. $\sin(1)/2$

   D. $\cos(1)/2$

   E. $\sin(1)$

2. Which of the following gives the double integral of $f(x,y)$ over the region in the first quadrant bounded by the circles $r = 1$ and $r = 2$?

   A. $\int_0^{\pi/2} \int_1^2 f(r\cos\theta, r\sin\theta)\, dr\, d\theta$

   B. $\int_0^{\pi} \int_1^2 f(r\cos\theta, r\sin\theta)\, dr\, d\theta$

   C. $\int_0^{\pi} \int_1^2 f(r\cos\theta, r\sin\theta)\, r\, dr\, d\theta$

   D. $\int_0^{\pi/2} \int_1^2 f(r\cos\theta, r\sin\theta)\, r\, dr\, d\theta$

   E. $\int_0^{\pi/2} \int_1^2 f(r,\theta)\, r\, dr\, d\theta$

3. Find $\iiint_E xy\, dV$ if $E = \{(x,y,z) : 0 \le x \le 3,\ 0 \le y \le x,\ 0 \le z \le x + y\}$.

   A. 40

   B. $\pi/4$

   C. $51/2$

   D. $75/2$

   E. $81/2$

4. Which of the following is the correct expression for the triple integral $\iiint_E f(x,y,z)\,dV$ over the region in the half-space $y \geq 0$ bounded by the cylinders $r = 1$, $r = 5$, and the planes $z = 0$ and $z = 4$?

   A. $\int_0^{\pi/2} \int_1^5 \int_0^4 f(r\cos\theta, r\sin\theta, z)\,dz\,r\,dr\,d\theta$

   B. $\int_0^{\pi} \int_1^5 \int_0^4 f(r\cos\theta, r\sin\theta, z)\,dz\,r\,dr\,d\theta$

   C. $\int_0^{\pi/2} \int_1^5 \int_0^4 f(r,\theta,z)\,dz\,r\,dr\,d\theta$

   D. $\int_0^{\pi/2} \int_1^5 \int_0^4 f(r,\theta,z)\,dz\,dr\,d\theta$

   E. $\int_0^{\pi} \int_1^5 \int_0^4 f(r,\theta,z)\,dz\,dr\,d\theta$

5. Find the Jacobian

$$J = \begin{vmatrix} \dfrac{\partial x}{\partial u} & \dfrac{\partial x}{\partial v} \\ \dfrac{\partial y}{\partial u} & \dfrac{\partial y}{\partial v} \end{vmatrix}$$

   of the transformation $x = 2u + v^2$, $y = 4u + v$

   A. $4 + 4v$

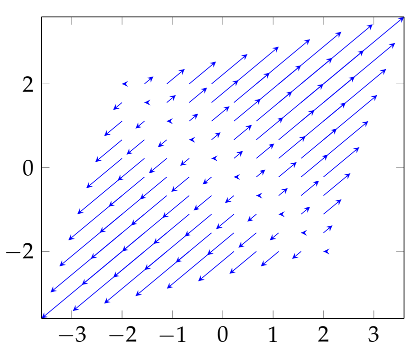
   B. $2 + 8v$

   C. $(u + 2v)(4u + v)$

   D. $8 + 8v$

   E. $2 - 8v$

6. The accompanying field plot shows the gradient vector field of a function $f(x,y)$. Which of these functions has the vector field shown as its gradient vector field?



   A. $f(x,y) = x^2 + y^2$

   B. $f(x,y) = x$

   C. $f(x,y) = x - y$

   D. $f(x,y) = x + y$

   E. $f(x,y) = (x + y)^2$

7. Find $\int_C x^2 y\, ds$ if C is the curve $(\cos t, \sin t)$ for $0 \leq t \leq \pi/2$

   A. $1/3$

   B. $\pi/2$

   C. $1/6$

   D. $\pi/4$

   E. $1/2$

8. If the rectangular of a point are $(1, \sqrt{3}, 4)$, what are the cylindrical coordinates of the same point?

   A. $(\rho, \theta, \phi) = (2, \pi/3, \pi/2)$

   B. $(\rho, \theta, z) = (2, \pi/6, 4)$

   C. $(r, \theta, z) = (2, \pi/3, 4)$

   D. $(\rho, \theta, z) = (\sqrt{18}, \pi/3, 4)$

   E. $(\rho, \theta, z) = (\sqrt{18}, \pi/6, 4)$

9. Suppose that $\mathbf{F}(x, y) = 2xe^{-y}\mathbf{i} + (2y - x^2e^{-y})\mathbf{j}$. Find a function f so that $\mathbf{F} = \nabla f$.

   A. $f(x, y) = x^2e^{-y} - y^3/3$

   B. $f(x, y) = 2xe^{-y} + y^2$

   C. $f(x, y) = x^2e^{-y} + y^3/3$

   D. $f(x, y) = x^2e^{-y} + y^2$

   E. $f(x, y) = 2xe^{-y} + y^3/3$

10. Find $\int_C (x^2 + y^2 + z^2)\, ds$ if $(x(t), y(t), z(t)) = (t, \cos 2t, \sin 2t)$ and $0 \leq t \leq 1$.

    A. $4\sqrt{5}$

    B. $4\sqrt{5}/3$

    C. $3\sqrt{5}/4$

    D. $5\sqrt{3}/4$

    E. $3\sqrt{5}$