

NAME _____

STUDENT ID # _____

RECITATION INSTRUCTOR _____

RECITATION TIME _____

DIRECTIONS

- 1) Fill in the above information. Also write your name at the top of each page of the exam.
- 2) The test has 8 pages, including this one.
- 3) Problems 1 through 5 are multiple choice; circle the correct answer.
- 4) Problems 6 through 9 are problems to be worked out. Write your answer in the box provided. **YOU MUST SHOW SUFFICIENT WORK TO JUSTIFY YOUR ANSWERS. CORRECT ANSWERS WITH INCONSISTENT WORK MAY NOT RECEIVE CREDIT.**
- 5) Points for each problem are given in parenthesis in the left margin.
- 6) No books, notes, or calculators may be used on this test.

Page 2	/20
Page 3	/20
Page 4	/12
Page 5	/12
Page 6	/12
Page 7	/14
Page 8	/10
TOTAL	/100

(8) 1) The function, $f(x, y)$ satisfies $f(0, 0) = 4$, $f_x(0, 0) = 3$, $f_y(0, 0) = 2$. Find an approximate value of $f(0.002, -0.001)$:

- A. 3.996
- B. 4.001
- C. 4.004
- D. 4.005
- E. 4.008

(12) 2) Find the minimum and maximum values of the function $f(x, y) = x^2 - 4x + y^2 - 2y$ on the disk $x^2 + y^2 \leq 20$:

- A. 0 and 32
- B. 0 and 40
- C. -5 and 32
- D. -5 and 40
- E. 32 and 40

(10) 3) Evaluate the integral

$$\int_0^{\sqrt{\pi}} \int_0^z \sin(z^2) dy dz :$$

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

(10) 4) Reversing the order of integration in $\int_2^3 \int_0^{9-x^2} f(x, y) dy dx = \int_0^a \int_b^c f(x, y) dx dy$, we have:

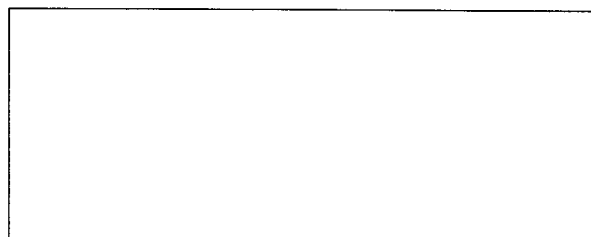
- A. $a = 2, b = 3, c = \sqrt{9-y}$
- B. $a = 3, b = 5, c = -\sqrt{9-y}$
- C. $a = 5, b = 3, c = \sqrt{9-y}$
- D. $a = 3, b = 2, c = \sqrt{9-y}$
- E. $a = 5, b = 2, c = \sqrt{9-y}$

(12) 5) The surface area of the portion of the paraboloid $z = 2 - x^2 - y^2$ that lies inside the cone $z = \sqrt{x^2 + y^2}$ is:

- A. $\frac{\pi}{6} (5^{\frac{3}{2}} - 1)$
- B. $\frac{\pi}{6} (17^{\frac{3}{2}} - 1)$
- C. $\frac{\pi}{6} \cdot 5^{\frac{3}{2}}$
- D. $\frac{\pi}{6} \cdot 17^{3/2}$
- E. $\frac{15\pi}{6}$

(12) 6) Find and classify the critical points of $f(x, y) = x^3 + 3xy + \frac{3}{2}y^2$:

Answer to 6)



- (2) 7.a) Find the radius and the center of the circle $x^2 + y^2 - x = 0$.

Answer to 7.a)

- (2) 7.b) Write the equation of the circle $x^2 + y^2 - x = 0$ in polar coordinates in its simplest form.

Answer to 7.b)

- (8) 7.c) Convert the integral $\int_0^1 \int_{\sqrt{x-x^2}}^{\sqrt{1-x^2}} (x^2 + y^2) dy dx$ to an iterated integral in polar coordinates. Do not evaluate the integral.

Answer to 7.c)

- 8) A solid occupies that part of the sphere of radius 5 about the origin which lies in the second octant ($x < 0, y > 0, z > 0$). Its mass density at (x, y, z) is $\delta(x, y, z) = z$. Set up (do not evaluate) triple integrals which give the mass of the solid:
- (7) 8.a) in rectangular coordinates.

Answer to 8.a)

- (7) 8.b) in cylindrical coordinates.

Answer to 8.b)

- (10) 9.) Set up (do not evaluate) a triple integral which gives the volume of a solid bounded by the coordinate planes and the plane $2x + y + z = 6$.

Answer to 9.)