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.

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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. $\frac{\pi}{6}\left(5^{\frac{3}{2}} - 1\right)$

B. $\frac{\pi}{6}\left(17^{\frac{3}{2}} - 1\right)$

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.)