Math 2263	**Name (Print):** ______________________
Spring 2008	**Student ID:** ______________________
Midterm 2	**Section Number:** __________
April 3, 2008	**Teaching Assistant:** ______________________
Time Limit: 50 minutes	**Signature:** ______________________

This exams contains 7 pages (including this cover page) and 6 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated. **Calculators may be used.** Please turn off cell phones.
Do not give numerical approximations to quantities such as $\sin 5$, π, or $\sqrt{2}$. However, you should simplify $\cos \frac{\pi}{2} = 0$, $e^0 = 1$, and so on.

The following rules apply:

- **Show your work**, in a reasonably neat and coherent way, in the space provided. **All answers must be justified by valid mathematical reasoning.** To receive full credit on a problem, you must show enough work so that your solution can be followed by someone without a calculator.

- **Mysterious or unsupported answers will not receive full credit**. Your work should be mathematically correct and carefully and legibly written.

- **A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit**; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.

1	10 pts	
2	10 pts	
3	15 pts	
4	20 pts	
5	20 pts	
6	25 pts	
TOTAL	100 pts	

1. (10 points) Let R be the rectangle $0 \leq x \leq \ln 7$, $0 \leq y \leq \ln 3$. Find the double integral

$$\iint_R e^{x+2y}\, dA.$$

2. (10 points) Let R be the square $-2 \le x \le 2$, $-2 \le y \le 2$ in the (x, y)-plane. If a continuous function $f(x, y)$ satisfies

$$0 \le f(x, y) \le |x|,$$

what does this tell you about the value of $\iint_R f(x, y)\, dA$?

3. (10 points) Let R be the triangle $0 \leq x \leq 1$, $0 \leq y \leq x$ in the (x, y)-plane. Find the double integral

$$\iint_R e^{x^2}\, dA.$$

4. (20 points) A plate is in the shape of the triangle D: $x \geq 0, y \geq 0, x + y \leq 1$. The plate has mass density at the point (x, y) equal to $\rho(x, y) = 1 - x - y$.
(a) (10 points) Find the **total mass** m of the plate.

(b) (10 points) Find the **center of mass** $(\overline{x}, \overline{y})$ of the plate.

5. **(20 points)** **(a)** (5 points) Let D be the circular disk of radius 2 and center $(0,0)$ in the (x,y)-plane. Write a double integral over the domain D with respect to area which represents the **volume** bounded above by the hemisphere $z=\sqrt{4-x^2-y^2}$ and below by the (x,y)-plane.

(20 points) **(b)** (5 points) Convert this integral to **polar coordinates.**

(20 points) **(c)** (10 points) Evaluate this integral.

6. (25 points) Let $f(x, y) = 2x^3 + xy^2 + 5x^2 + y^2$.
(a) (5 points) Compute the first and second partial derivatives of $f(x, y)$.

(b) (10 points) Find all the **critical points** of $f(x, y)$.

(c) (10 points) For each critical point, state whether it is a **local minimum point**, a **local maximum point** or a **saddle point**.