**February 27, 2003** **Name (Please Print)** _____

**Math 125 C,D—Second Midterm Exam—Winter 2003**

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**Your T.A.** _____ **Your Signature** _____

**Quiz Section** | | | **Student I.D.#** | | | | | | | |

This is a *limited open note* exam. You may use one page of notes that are *in your own handwriting*. You may *not* use books, printed matter, etc.

You may *not* use graphing or programmable calculators. You may use a "scientific calculator" (capable of doing trig functions, exponentials, and logarithms).

There are 5 problems. Each problem is worth 10 points, for a total of 50 points. Show all of your work. Partial credit will be given for partial solutions. Correct answers with insufficient or incorrect work will *not* get much credit.

**Please note:** Give all answers as EXACT answers (like $\pi/6$ or $1+\sqrt{2}$) unless you are explicitly given directions otherwise.

**Score**

| | | |
|---|---|---|
| 1. | (10) | |
| 2. | (10) | |
| 3. | (10) | |
| 4. | (10) | |
| 5. | (10) | |
| Total | (50) | |
| Exam Grade | | |

1. Find the average value of $f(x) = \dfrac{(\sin^2 x)(\cos x)}{(\sin^2 x) - 4}$ on the interval $-\pi/2 \leq x \leq \pi/2$.

2.(a) (5 points) Evaluate the indefinite integral $\int \frac{x}{x^2+2x+5}\,dx$ .

(b) (5 points) Evaluate the improper integral $\int_2^\infty \frac{x}{(x^2+1)^2}\,dx$.

3.(a) (5 points) Evaluate the indefinite integral $\int \frac{1}{(9-x^2)^{3/2}}\,dx$.

(b) (5 points) Evaluate the indefinite integral $\int \frac{x^3}{\sqrt{x^2+4}}\,dx$.

4. The region in the $xy$-plane between the lines $x = 0$ and $x = \pi$, above the $x$-axis and below the graph of $y = \sin^2 x$, is rotated around the $x$-axis. (*Note: around the $x$-axis*)

(a) (2 points) Express the volume of the solid of revolution as a definite integral with respect to $x$. IN THIS PART, DO NOT EVALUATE THE INTEGRAL YET.

(b) (4 points) Give an approximate value for the volume by using Simpson's rule with $n = 4$ subintervals to approximate the integral in part (a).

(c) (4 points) Evaluate the integral in part (a) exactly to find the exact volume of the solid of revolution.

5. The region in the $xy$-plane between the lines $x = 1$ and $x = 3$, above the $x$-axis and below the graph of $y = \ln x$, is rotated around the $y$-axis. (*Note: around the $y$-axis*)

(a) (3 points) Express the volume of the solid of revolution as a definite integral with respect to $x$. IN THIS PART, DO NOT EVALUATE THE INTEGRAL YET.

(b) (7 points) Evaluate the integral in part (a) to find the volume of the solid of revolution.