

Name \_\_\_\_\_ Instructor \_\_\_\_\_ Your class time \_\_\_\_\_

**MATH 104 - MIDTERM EXAM**  
Thursday March 13, 2003, 7:30PM-9:00PM  
McDonnell A02

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This examination booklet contains 9 problems on 10 sheets of paper including the front cover. Do all of your work in this booklet and show all your computations. This is a closed book exam.

**Calculators are NOT allowed.** This exam was designed so that all problems could be solved without heavy computations.

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Problem	Possible score	Your score
1	12	
2	12	
3	12	
4	12	
5	12	
6	12	
7	12	
8	6	
9	10	
Total	100	

WRITE OUT AND SIGN PLEDGE:

I pledge my honor that I have not violated the Honor Code during this examination.

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GRADES CAN BE OBTAINED ON THE WEB, AT THE BLACKBOARD WEB SITE FOR THE COURSE.

1. (12 points) Find  $\int \frac{\sin^3(\ln x) \cos^2(\ln x)}{x} dx$ .

2. (12 points) Find  $\int \frac{\ln(x^2 + x + 1)}{x^2} dx$ .

3. (12 points) Find  $\int e^{3x} \arctan(e^x) dx$ .

4. (12 points) Find  $\int_0^2 \frac{dx}{\sqrt{x^2 + 4x}}$ .

5. (12 points) Find  $\int \sin^2 \theta \cos 3\theta \, d\theta$ .

6. (12 points) Set up an integral for the area of the region enclosed between the curve  $y = x^3 - 2$  and its tangent line at  $x = -1$ . **JUST SET UP THE INTEGRAL. DO NOT COMPUTE A NUMERICAL VALUE.**

7. (12 points) The region  $R$  is bounded by the curves  $y = \ln x$ ,  $y = 0$  and  $x = e$ . The solid  $S$  is obtained by revolving  $R$  around the  $y$ -axis.
- (a) Set up an integral for the volume of  $S$  using the shell method.
  - (b) Set up an integral for the volume of  $S$  using the disk or washer method.
  - (c) Compute the volume of  $S$ .



8. (6 points) Sketch the curve given in polar coordinates by  $r = 1 + \sin \theta$ .

9. (10 points) Find the length of the curve  $y = \frac{e^x + e^{-x}}{2}$  as  $x$  runs from 0 to 1.