**Mathematics 222, Spring 2002** **Your Name:** _____

**Circle your teacher's name:**

**Bret Benesh  Duane Ellington  Rob Ely  Adrian Jenkins**

**Andrew Shallue  Nat Thiem  Bob Wilson**

## Exam 1: February 21, 2002  Shared Portion of Exam

- Your exam is in two parts. This part is common to the several sections being taught in small classes this semester, and there is an additional part unique to your section.
- Write your answers to the four problems in the spaces provided. If you must continue an answer somewhere other than immediately after the problem statement, be sure (a) to tell where to look for the answer, and (b) to label the answer wherever it winds up. In any case, be sure to circle your final answer to each problem.
- Wherever applicable, leave your answers in exact forms (using $\pi$, $e$, $\sqrt{3}$, $\ln(2)$, and similar numbers) rather than using decimal approximations.
- There is scratch paper on the back of this sheet. If you need more scratch paper, please ask for it.

BE SURE TO SHOW YOUR WORK: YOU MAY RECEIVE REDUCED OR ZERO CREDIT FOR UNSUBSTANTIATED ANSWERS.

| Problem | Points | Score |
|---|---|---|
| 1 | 16 | |
| 2 | 16 | |
| 3 | 16 | |
| 4 | 16 | |
| TOTAL | 64 | |

SCRATCH PAPER

Problem 1 (16 points)
Evaluate the integrals:

(a) $\displaystyle\int \frac{dx}{x^2\sqrt{4+x^2}}$

(b) $\displaystyle\int \arctan(x)\,dx$

Problem 2 (16 points)
Evaluate the integrals. If you claim an integral does not exist be sure to give reasons!

(a) $\displaystyle\int_0^4 \frac{x}{x^2-1}\,dx$

(b) $\displaystyle\int_0^{\frac{\pi}{3}} \tan^3 x\,dx$

Problem 3 (16 points)
Evaluate the integrals. If you claim an integral does not exist be sure to give reasons!

(a) $\displaystyle\int_1^4 \frac{\ln x}{\sqrt{x}}\,dx$

(b) $\displaystyle\int_e^\infty \frac{dx}{x(\ln x)^3}$

Problem 4 (16 points)
Find the limits of the sequences:

(a) The sequence of partial sums of the series $\displaystyle\sum_{k=0}^{\infty} \frac{4^k}{3^{2k-1}}$

(b) $a_n = n \sin\left(\frac{1}{n}\right)$