Mathematics 222, Lecture 2 (Wilson) Your Name: _____

Circle your TA's name:

Ethan Berkove Youngwoo Choi Joseph Duffy

Daode Huang Jonathan Kochavi Chang Ock Lee

Exam I 10/7/93

Write your answers to the eight 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 π, e, $\sqrt{3}$, $\ln(2)$, and similar numbers) rather than using decimal approximations.

There is scratch paper at the end of the exam. If you need more scratch paper, please ask for it.

You may refer to notes you have brought in on one 4" by 6" index card, as announced in class.

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

Problem	Points	Score
1	12	
2	14	
3	14	
4	12	
5	14	
6	10	
7	12	
8	12	
TOTAL	100	

Problem 1 (12 points)
Evaluate the following integrals:
(a)

$$\int (\tan(x) + \sec(x))^2 dx$$

(b)

$$\int_0^{\frac{\pi}{4}} \frac{1 + \sin(x)}{\cos^2(x)} dx$$

Problem 2 (14 points)
Evaluate the following integrals:
(a) (6 points)

$$\int_2^\infty \frac{1}{x^3}\, dx$$

(b) (8 points)

$$\int e^{2x} \cos(x)\, dx$$

Problem 3 (14 points)
Evaluate the following integrals:
(a) (6 points)

$$\int_1^2 x \ \ln(x)\ dx$$

(b) (8 points)

$$\int \sin^2(2x)\ \cos^3(2x)\ dx$$

Problem 4 (12 points)
Evaluate the integral:

$$\int \left(\frac{1}{\sqrt{9x^2+1}} \right)^3 dx$$

Problem 5 (14 points)
Evaluate the integral:

$$\int \frac{3x^2 + 8x + 9}{(x^2 + 2x + 5)(x + 2)}\, dx$$

Problem 6 (10 points)
Evaluate the integral:

$$\int_{-1}^{1} \frac{1}{\sqrt{|x|}} dx$$

Problem 7 (12 points)
For each of the sequences a_n below, tell *whether* it converges and,
(i) if it converges, tell the limit:
(ii) if it does NOT converge, tell how you know that.
You do NOT need to give a formal proof of convergence or divergence using epsilon and N.

(a)

$$a_n = \frac{2n + \sin(n)}{n}$$

(b)

$$a_n = \frac{2}{n} + \sin(n)$$

(c)

$$a_n = \frac{n+1}{2n^2 + 2n + 3}$$

(d)

$$a_n = \frac{n^2 + 1}{2n^2 + 2n + 3}$$

Problem 8 (12 points)
Find the sum of each series which converges: For each series which does not converge tell how you know it doesn't.

(a)

$$\sum_{n=1}^{\infty} \frac{5}{3^n}$$

(b)

$$\sum_{n=1}^{\infty} \left(\frac{5}{3}\right)^n$$

SCRATCH PAPER