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

Circle your TA's name:

Joni Baker John Brown Brian Curtin Stephanie Edwards

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Exam I 2/28/95

- 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
  - to tell where to look for the answer, and
  - to label the answer wherever it winds up. In any case, be sure to circle your final answer to each problem.
- You may use your calculator in doing these problems. If you do some of the work using a calculator, however, be sure to tell precisely what you asked the calculator to do. On all answers be sure to show your work.
- Unsupported answers, even if they give the correct final answer, may receive little or no credit.
- Wherever possible, (even in calculator-assisted answers!) 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 attached. If you need more scratch paper, please ask for it.
- You may refer to notes you have brought in on one sheet of paper.

Problem	Points	Score
1	12	
2	14	
3	16	
4	12	
5	12	
6	10	
7	12	
8	12	
TOTAL	100	

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

$$\int_0^1 \frac{x^2}{x^2+1} dx$$

(b)

$$\int_0^{\frac{\pi}{4}} \frac{\tan(x) - \sec(x)}{\cos(x)} dx$$

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

$$\int_0^\infty \frac{1}{(x-1)^2}\, dx$$

(b)

$$\int e^x \sin(2x)\, dx$$

Problem 3 (16 points)
Evaluate the following integrals:
(a)

$$\int e^{\sqrt{x}}\, dx$$

(b)

$$\int_0^{\frac{\pi}{2}} \sin^{\frac{5}{2}} x \ \cos^3 x \ dx$$

Problem 4 (12 points)
Evaluate the integral:

$$\int \frac{x^2}{\sqrt{1-x^2}} dx$$

Problem 5 (12 points)
Evaluate the integral:

$$\int \frac{6x^2 - 16x + 14}{(x^2 - 2x + 2)(x - 3)}\, dx$$

Problem 6 (10 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)

$$a_n = \frac{n+1}{1+\sqrt{n}}$$

(b)

$$a_n = \left(1+\frac{2}{n}\right)^n$$

Problem 7 (12 points)
For each of these series, tell whether it converges and give a reason for your answer. IF IT DOES CONVERGE, what is the sum?

(a)

$$\sum_{n=1}^{\infty} \cos(n\pi)$$

(b)

$$\sum_{n=4}^{\infty} \frac{2^{n+1}}{7^n}$$

Problem 8 (12 points)
For each of these series, tell whether it converges and give a reason for your answer. You do NOT have to tell WHAT it converges to, if it does converge.

(a)

$$\sum_{n=1}^{\infty} \frac{1}{1+n\sqrt{n}}$$

(b)

$$\sum_{n=1}^{\infty} \frac{2^n}{n!}$$

SCRATCH PAPER