1. (10) Evaluate

$$\int x \cos^2(3x)\, dx.$$

2. (10) Evaluate

$$\int e^{5x} \sin x \, dx.$$

3. (10) Evaluate

$$\int \sec^4(x) \tan^4(x) \, dx$$

4. (10) Evaluate

$$\int \frac{dx}{(9 - x^2)^{3/2}} \, dx$$

5. (12) Find the value of the series

$$\sum_{n=1}^{\infty} \frac{2^{n+1} + 9^{n/2}}{5^n}.$$

6. (12) Prove whether the series

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

converges or diverges.

7. (12) Determine if the series
$$\sum_{n=1}^{\infty} \frac{\sin^2(n) \cos^2(n)}{n^3 + 2n}$$
converges. Mention any test(s) that you might use and verify that they are applicable.

8. (12) Determine if the series
$$\sum_{n=2}^{\infty} \frac{n^2 + 2n - 1}{\sqrt{n^5 - 4}}$$
converges. Mention any test(s) that you might use and verify that they are applicable.

9. (12) Determine if the series

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

converges. Mention any test(s) that you might use and verify that they are applicable.

10. (12) Find the radius and interval of convergence for the power series

$$\sum_{n=1}^{\infty} \frac{(x-2)^n}{6^n \sqrt{n}}.$$

11. (10) Find a power series representation for the function

$$f(x) = 3x^4 \arctan(x)$$

12. (20) This question has 6 short answer parts.

(a) Could you in principle compute $\int x^{10^{10}} e^x \, dx$, and if so, how?

(b) What substitution would you use to evaluate $\int x^3 \sqrt{16 + x^2} \, dx$?

(c) Does $\int_2^\infty \dfrac{dx}{x^{\sqrt{2}} - \sqrt{2}} \, dx$ converge?

(d) Find a formula for the general term, a_n, of the sequence $\frac{5}{2}, \frac{-8}{4}, \frac{11}{8}, \frac{-14}{16}, \ldots$

(e) Find $\lim\limits_{n \to \infty} \dfrac{\ln(n)}{\ln(3n)}$.

(f) Find the error if you use s_4 (the sum of the first 4 terms) to approximate the series

$$\sum_{n=1}^{\infty} (-1)^n \frac{n^2}{2^n}.$$

Math 8

4 Feb 2008
Midterm 1

INSTRUCTIONS: This is a closed book exam and no notes are allowed. You are not to provide or receive help from any outside source during the exam except that you may ask the instructor for clarification of a problem. You have two hours and you should attempt all problems.

- **Except in Problem 8, you must show all work and give a reason (or reasons) for your answer. A CORRECT ANSWER WITH INCORRECT WORK WILL BE CONSIDERED WRONG.**

- *Print* your name in the space provided and circle your instructor's name.

- Calculators or other computing devices are not allowed.

- Use the blank page at the end of the exam for scratch work.

FERPA RELEASE: Because of privacy concerns, we are not allowed to return your graded exams in lecture without your permission. If you wish us to return your exam in lecture, please sign on the line indicated below. Otherwise, you will have to pick your exam up in your instructor's office after the exams have been returned in lecture.

SIGN HERE: _____.

Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	12	
6	12	
7	12	
8	12	
9	12	
10	12	
11	10	
12	20	
Total	142	