Math 126: Calculus II
Exam II   *November 9, 2000*

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There are 7 problems on 7 pages worth a total of 84 points. You start with 16 points. Each part of a problem is worth the same number of points.

You may use a calculator if you wish.

To receive partial credit on a problem, you must *show your work and all important steps.* No credit will be given for an answer if no work is shown.

1. (12 pts) Evaluate the integrals.

   a) $\displaystyle \int x e^{2x}\, dx$

   b) $\displaystyle \int \frac{\sqrt{x^2+1}}{x^4}\, dx$

2. (6 pts) Find the partial fraction decomposition of $\dfrac{x+2}{x^2(x^2+1)}$.

3. (6 pts) Compute the value of the series $\displaystyle\sum_{n=1}^{\infty} \dfrac{3^n + 2(-1)^{n+1}}{4^n}$.

4. (12 pts) Find the limit of each sequence, or show it does not exist.

a) $a_n = \dfrac{(-1)^n n}{n + 1}$

b) $a_n = n \sin(1/n)$

5. (12 pts) Consider the series $s = \sum_{n=1}^{\infty} \ln\left(\frac{n}{n+1}\right)$.

a) Compute the 4th partial sum, s_4, exactly.

b) Find the value of s or show the series diverges.

6. (24 pts) Determine whether the following series converge.

a) $\displaystyle\sum_{n=2}^{\infty} \left(1 - \frac{1}{n}\right)^n$

b) $\displaystyle\sum_{n=2}^{\infty} \frac{\sqrt{n}}{n^2 - 1}$

c) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n(\ln(n))^3}$

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

7. (12 pts)

a) Show that the series $\sum_{n=1}^{\infty}(-1)^{n+1}\dfrac{n!}{(2n-1)!}$ converges.

b) Find an approximate value of the sum of the series with an error which is less than 10^{-2}. Be sure to explain why the error is less than 10^{-2}.