Math 107-Sec 250 **Exam 2** **Name:** ____________________

Spring 2003 **Recitation Instructor:** ____________________

No.	1(a, b)	1(c)	2	3	4	5	6	Total
score								

1. (30 points, 10 points each) Evaluate each of the following integrals **(You must show all of your work to receive full credit. Here, no calculators allowed).**

   a. $\int x^2 \ln x dx$

   b. $\int_0^{\pi/2} \cos^{16} x \sin^3 x dx$

c. $\displaystyle\int \frac{5x-3}{x(x-1)}\,dx$

2. (10 points) For what values of x does the series

$$\sum_{k=2}^{\infty}(-1)^k(3x^2)^k = (3x^2)^2 - (3x^2)^3 + (3x^2)^4 - \dots \tag{1}$$

converge? and to what?

3. (20 points) Determine whether the following improper integrals are convergent or divergent. If the integral is convergent find its value. **Make sure to show all details.**

a.(10 pts) $\displaystyle\int_0^\infty \frac{x}{1+x^4}dx$

b.(10 pts) $\displaystyle\int_1^2 \frac{1}{(x-1)^{1.1}}dx$

4. (10 points) By using a comparison theorem determine whether the following integral is convergent or divergent: $\displaystyle\int_1^\infty \frac{4-\cos 3x}{x^2+7}dx.$

5. (10 points) Consider the series $\displaystyle\sum_{k=1}^{\infty} \frac{1}{(k+2)(k+3)}$. Find the exact value of its n^{th} partial sums $S_n = \displaystyle\sum_{k=1}^{n} \frac{1}{(k+2)(k+3)}$ and determine whether the series is convergent or divergent by computing $\displaystyle\lim_{n\to\infty} S_n$.

6. (20 points) Determine whether the following series converge or diverge. If the series is convergent find its sum.

   a.(10 pts) $\displaystyle\sum_{k=3}^{\infty} \left(\frac{1}{\pi}\right)^k$

   b.(10 pts) $\displaystyle\sum_{k=1}^{\infty} \frac{2k^2-1}{5k^2+3}$