MATH 1220-6
Fall 2003
Midterm exam III

Student Name: ____________________

Student ID Number: ____________

Course Abbreviation and Number:	*Math 1220*
Course Title:	*Calculus II*
Instructor:	*Vladimir Vinogradov*

Date of Exam:	*November 20, 2003*
Time Period:	Start time: *7:00 pm* End Time: *8:00 pm*
Duration of Exam:	*1 hours*
Number of Exam Pages: (including this cover sheet)	*10*
Exam Type:	*Closed Book*
Additional Materials Allowed:	*Calculator*

QUESTION	VALUE	SCORE
1	20	
2	20	
3	20	
4	20	
5	20	
TOTAL	100	

1. (20 points) Does the series converge or diverge? Give reasons.

a) $\displaystyle\sum_{n=1}^{\infty} \frac{n!}{e^n}$

ANSWER: ____________________

b) $\displaystyle\sum_{m=1}^{\infty}(-1)^m \frac{e^{\sin(m\pi)}}{m^2}$

ANSWER: ________________________

2. (20 points) Use the Integral Test to decide the convergence or divergence of the following series:

$$\sum_{n=1}^{\infty} k\, e^{-\frac{k^2}{2}}.$$

ANSWER: ____________________

3. (20 points) Find the sum of

$$\sum_{n=0}^{\infty}(n+1)\frac{2^n}{3^n}.$$

ANSWER: ______________________

4. (20 points) What is the interval of convergence of the power series? Show your work.

a) $\sum_{k=1}^{\infty} \frac{(3x+1)^k}{k\ 2^k}$

ANSWER: ______________________

b) $\sum_{k=1}^{\infty} \frac{(-1)^k (x-2)^k}{k^2}$

ANSWER: ______________________

5. (20 points) Find the Maclaurin series for the function.

a) $f(x) = e^{2x} - 1 - 2x$

ANSWER: ______________________

b) $g(x) = \dfrac{1}{2+3x}$

ANSWER: ______________________

Useful formulae

$$\log_a x = \frac{\ln x}{\ln a}, \qquad a^x = e^{x\ln a},$$

$$\log_a x^n = n\log_a x, \qquad a^b a^c = a^{b+c},$$

$$(x^\alpha)' = \alpha x^{\alpha-1}, \qquad (a^x)' = a^x \ln a,$$

$$(\ln x)' = \frac{1}{x}, \qquad \int \ln x dx = x\ln x - x + C$$

$$e^x = \sum_{k=0}^{\infty} \frac{x^k}{k!} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!}$$

$$(1+x)^p = 1 + \sum_{k=1}^{\infty} \binom{p}{k} x^k \qquad |x| < 1,$$

where $\binom{p}{k} = \frac{p(p-1)(p-2)(p-3)\dots(p-k+1)}{k!}$

$$\frac{1}{1-x} = \sum_{k=0}^{\infty} x^k = 1 + x + x^2 + x^3 \dots \qquad |x| < 1$$

$$\frac{x}{1-x} = \sum_{k=1}^{\infty} x^k = x + x^2 + x^3 + x^4 \dots \qquad |x| < 1$$

$$\ln(1+x) = \sum_{k=1}^{\infty} (-1)^{k+1} \frac{x^k}{k} = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} \dots \qquad |x| < 1$$