

MATH 1220-6
Fall 2003
Midterm exam II

Student Name: _____

Student ID Number: _____

Course Abbreviation and Number:	<i>Math 1220</i>
Course Title:	<i>Calculus II</i>
Instructor:	<i>Vladimir Vinogradov</i>

Date of Exam:	<i>October 23, 2003</i>
Time Period:	<i>Start time: 7:00 pm End Time: 8:00 pm</i>
Duration of Exam:	<i>1 hours</i>
Number of Exam Pages:	<i>10</i>
<i>(including this cover sheet)</i>	
Exam Type:	<i>Closed Book</i>
Additional Materials Allowed:	<i>Calculator</i>

QUESTION	VALUE	SCORE
1	30	
2	30	
3	40	
TOTAL	100	

1. (30 points) Find all the integrals.

a) $\int x \ln(2x) dx$

ANSWER: _____

b) $\int \frac{\ln(x^2)}{x} dx$

ANSWER: _____

c) $\int x(e^x + 1)dx$

ANSWER: _____

2. (30 points) Find the limits.

a) $\lim_{x \rightarrow \infty} \frac{e^{x+2}}{e^{2x}}$

ANSWER: _____

b) $\lim_{x \rightarrow e} \frac{\ln(x) - 1}{\ln(\ln(x))}$

ANSWER: _____

c) $\lim_{x \rightarrow \infty} \frac{x(1 + 2x)}{3x^2 + 1}$

ANSWER: _____

3. (40 points) Does the integral converge or diverge? Give reasons. If you can, evaluate the integral.

a) $\int_0^{\infty} x e^{-x^2} dx$

ANSWER: _____

b) $\int_3^{\infty} \frac{dx}{x(\ln x)^2}$

ANSWER: _____

Useful formulae

Product rule:

$$(f(x)g(x))' = f'(x)g(x) + f(x)g'(x)$$

Quotient rule:

$$\left(\frac{f(x)}{g(x)}\right)' = \frac{f'(x)g(x) - f(x)g'(x)}{g^2(x)}$$

Chain rule:

$$\frac{d}{dx}f(g(x)) = \frac{df}{dg} \cdot \frac{dg}{dx}$$

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

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

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

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

Integration by Parts

$$\int u dv = u v - \int v du$$
$$\int_a^b u dv = u v|_a^b - \int_a^b v du$$

L'Hôpital's Rule (for forms of type $0/0$ and ∞/∞)

$$\lim_{x \rightarrow u} \frac{f(x)}{g(x)} = \lim_{x \rightarrow u} \frac{f'(x)}{g'(x)}$$