Name: ____________________

Student ID: ____________________

Section: ____________________

Instructor: ____________________

Math 113 (Calculus 2)
Exam 2
9-13 October 2009

Instructions:

1. Work on scratch paper will not be graded.
2. Should you have need for more space than is allotted to answer a question, use the back of the page the problem is on and indicate this fact.
3. Simplify your answers. Expressions such as $\ln(1)$, e^0, $\sin(\pi/2)$, $\tan^{-1}(1)$, etc. must be simplified for full credit.
4. Calculators are not allowed.

For Instructor use only.

#	Possible	Earned		#	Possible	Earned
M.C.	36			12	8	
10 a-c	12			13	8	
10 d-f	12			14	8	
11	8			15	8	
Sub	68			Sub	32	
				Total	100	

Answers to MC: 1C 2C 3D 4A 5B 6B 7D 8C 9E

Multiple Choice (36 points). Fill in the answer to each problem on your scantron. Make sure your name, section and instructor is on your scantron.

1. $\displaystyle\int_0^1 te^{-t}\,dt =$

   A. 1 B. $1-\dfrac{1}{e}$ C. $1-\dfrac{2}{e}$ D. $1+\dfrac{1}{e}$ E. $1+\dfrac{2}{e}$

2. $\displaystyle\int_0^{\pi/2} \sin^3 x\cos^2 x\,dx =$

   A. 0 B. $\dfrac{1}{15}$ C. $\dfrac{2}{15}$ D. $\dfrac{1}{5}$ E. $\dfrac{4}{15}$

3. $\displaystyle\int_0^{\pi} \cos^2 x\,dx =$

   A. $\dfrac{\pi}{5}$ B. $\dfrac{\pi}{4}$ C. $\dfrac{\pi}{3}$ D. $\dfrac{\pi}{2}$ E. π

4. $\displaystyle\int \frac{dx}{x^2\sqrt{x^2+4}}$

   A. $-\dfrac{\sqrt{x^2+4}}{4x}+C$ B. $-\dfrac{\sqrt{x^2+4}}{x}+C$ C. $\dfrac{\sqrt{x^2+4}}{4x}+C$ D. $\dfrac{\sqrt{x^2+4}}{x}+C$

5. $\displaystyle\int_{-1}^{0} \frac{dx}{x^2+2x+2} =$

   A. $\dfrac{\pi}{5}$ B. $\dfrac{\pi}{4}$ C. $\dfrac{\pi}{3}$ D. $\dfrac{\pi}{2}$ E. π

6. $\displaystyle\int_1^2 \frac{dx}{(x+1)(x+2)} =$

   A. $\ln\dfrac{10}{9}$ B. $\ln\dfrac{9}{8}$ C. $\ln\dfrac{8}{7}$ D. $\ln\dfrac{7}{6}$ E. $\ln\dfrac{6}{5}$ F. $\ln\dfrac{5}{4}$ G. $\ln\dfrac{4}{3}$

7. $\displaystyle\int_0^\infty \frac{dx}{1+x^2} =$

A. $\frac{\pi}{5}$ B. $\frac{\pi}{4}$ C. $\frac{\pi}{3}$ D. $\frac{\pi}{2}$ E. π

8. What is the integral definition of $\ln x$?

A. $\displaystyle\int_0^x \frac{1}{t}dt$ for $x > 0$ B. $\displaystyle\int_1^x \frac{1}{t}dt$ for $x > 1$ C. $\displaystyle\int_1^x \frac{1}{t}dt$ for $x > 0$

D. $\displaystyle\int_0^x \frac{1}{t}dt$ for all real numbers x E. $\displaystyle\int_1^x \frac{1}{t^2}dt$ for $x > 0$ F. $\displaystyle\int_1^e \frac{1}{t}dt$ for $x > 0$

9. $\displaystyle\int \sec^3 x\, dx =$

A. $\frac{1}{2}\sec x \tan x + C$ B. $\frac{1}{2}\ln|\sec x + \tan x| + C$ C. $\frac{1}{2}(\sec x + \ln|\sec x|) + C$

D. $\frac{1}{2}(\csc x \cot x + \ln|\csc x - \cot x|) + C$ E. $\frac{1}{2}(\sec x \tan x + \ln|\sec x + \tan x|) + C$

Short Answer. Fill in the blank with the appropriate answer. 4 points each. A correct answer gets full credit. You will need to show your work for partial credit.

10. (24 points)

(a) Use the integral definition of $\ln 2$ and the midpoint rule with $n = 2$ to approximate $\ln 2$.

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(b) If $f'(x) < 0$ and $f''(x) > 0$ for $a \le x \le b$, Order L_n, R_n, M_n and T_n where L_n is the left endpoint approximation, R_n is the right endpoint approximation, M_n is the midpoint rule, and T_n is the trapezoidal rule each using n subdivisions.

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(c) If $\sin\theta = x$, find $\sin 2\theta$ in terms of x.

(d) Evaluate $\displaystyle\int \frac{x^3+x+1}{x^2+1}\,dx$

(e) Circle the integrals that converge and put an X over the integrals that diverge.

A. $\displaystyle\int_1^\infty \frac{dx}{x^2}$ B. $\displaystyle\int_0^1 \frac{dx}{x^2}$ C. $\displaystyle\int_1^\infty \frac{3+\sin 2x}{x}\,dx$ D. $\displaystyle\int_0^1 \frac{3+\sin 2x}{\sqrt{x}}\,dx$

(f) A table for the function f is given. Use the table and Simpson's Rule with $n = 4$ to estimate $\displaystyle\int_0^2 f(x)\,dx$.

x	0.0	0.5	1.0	1.5	2.0
$f(x)$	2.5	2.8	3.0	3.2	3.5

Show your work for problems 11-15. Each problem is worth 8 points.

11. Evaluate the integral $\int_{-1}^{3} \sqrt{3+2t-t^2}\, dt$.

12. Evaluate the integral $\int \sqrt{\frac{1+x}{1-x}} dx$

13. Use the Comparison Theorem to determine whether the integral is convergent or divergent. $\int_{0}^{\infty} \frac{x^2}{x^5+7}\, dx$. Justify your reasoning.

14. Evaluate the integral $\displaystyle\int \sin 8x \sin 5x \, dx$.

15. Evaluate the integral $\displaystyle\int \frac{\sqrt{x^2 - 9}}{x^4} \, dx$.