Prof. Girardi	Math 142	Fall 2008	09.25.08	Exam 1

MARK BOX		
PROBLEM	POINTS	
1 a–y	25	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
take home	10	
Extra Credit	5	
%	100	

NAME **(legibly printed):** ______________________

class PIN: ______________________

(*) Extra Credit: 5 point for knowing yor PIN number.

INSTRUCTIONS:

(1) To receive credit you must:
   (a) **work in a logical fashion, show all your work, indicate your reasoning**;
   no credit will be given for an answer that *just appears*;
   such explanations help with partial credit
   (b) if a line/box is provided, then:
   — show you work BELOW the line/box
   — put your answer on/in the line/box
   (c) if no such line/box is provided, then box your answer

(2) The MARK BOX indicates the problems along with their points.
   Check that your copy of the exam has all of the problems.

(3) You may **not** use a calculator, books, personal notes.

(4) During this exam, do not leave your seat. If you have a question, raise your hand. When you finish: turn your exam over, put your pencil down, and raise your hand.

(5) This exam covers (from *Calculus* by Anton, Bivens, Davis 8^{th} ed.):
   Sections 8.1, 8.2, 8.3, 8.4, 8.5, 8.7, 8.8. .

Problem Inspiration: If I told you here, you would know what method to use. So see the solution key, which will be available from the course homepage shortly after the exam.

Hints:

(1) **You can check your answers to the indefinite integrals by differentiating.**

(2) **+ C**

(3) **For more partial credit, box your $u - du$ substitutions.**

1. Fill in the blanks (each worth 1 point).

1a. $\int \frac{du}{u} \;=\;$ __________ $|u| + C$

1b. If a is a constant and $a > 0$ but $a \neq 1$, then $\int a^u \, du \;=\;$ ______________________________ $+ C$

1c. $\int \cos u \, du \;=\;$ ____ $+ C$

1d. $\int \sec^2 u \, du \;=\;$ ____ $+ C$

1e. $\int \sec u \tan u \, du \;=\;$ ____ $+ C$

1f. $\int \sin u \, du \;=\;$ ____ $+ C$

1g. $\int \csc^2 u \, du \;=\;$ ____ $+ C$

1h. $\int \csc u \cot u \, du \;=\;$ ____ $+ C$

1i. $\int \tan u \, du \;=\;$ ____ $+ C$

1j. $\int \cot u \, du \;=\;$ ____ $+ C$

1k. $\int \sec u \, du \;=\;$ ____ $+ C$

1l. $\int \csc u \, du \;=\;$ ____ $+ C$

1m. If a is a contant and $a > 0$ then $\int \frac{1}{\sqrt{a^2-u^2}} \, du \;=\;$ ______________________________________ $+C$

1n. If a is a contant and $a > 0$ then $\int \frac{1}{a^2+u^2} \, du \;=\;$ ______________________________________ $+C$

1o. If a is a contant and $a > 0$ then $\int \frac{1}{u\sqrt{u^2-a^2}} \, du \;=\;$ __________________________________ $+ C$

1p. Partial Fraction Decomposition. If one wants to integrate $\frac{f(x)}{g(x)}$ where f and g are polyonomials and [degree of f] $\geq$ [degree of g], then one must first do ______________________________

1q. Integration by parts formula: $\int u \, dv \;=\;$ ____

1r. Trig substitution: (recall that the *integrand* is the function you are integrating)
if the integrand involves $a^2 - u^2$, then one makes the substitution $u \;=\;$ _________________________

1s. Trig substitution:
if the integrand involves $a^2 + u^2$, then one makes the substitution $u \;=\;$ _________________________

1t. Trig substitution:
if the integrand involves $u^2 - a^2$, then one makes the substitution $u \;=\;$ _________________________

1u. trig formula ... your answer should involve trig functions of θ, and not of 2θ: $\sin(2\theta) =$ ________________ .

1v. trig formula ... $\cos(2\theta)$ should appear in the numerator: $\cos^2(\theta) \;=\; \frac{\rule{6cm}{0.4pt}}{2}$.

1w. trig formula ... $\cos(2\theta)$ should appear in the numerator: $\sin^2(\theta) \;=\; \frac{\rule{6cm}{0.4pt}}{2}$.

1x. trig formula ... since $\cos^2\theta + \sin^2\theta = 1$, we know that the corresponding relationship beween tangent (i.e., tan) and secant (i.e., sec) is ____ .

1y. arctan($-\sqrt{3}$) = _________________ **RADIANS**. (your answer should be an angle)

2. $\displaystyle\int (\sec^3 x)\ (\tan^3 x)\ dx\ =$ $+ \text{C}$

3. $$\boxed{\int \frac{1}{\left(4+x^2\right)^2}\,dx \;=\; \qquad\qquad\qquad\qquad\qquad\qquad + \text{C}}$$

4. $$\boxed{\int \frac{x^3 + x^2 + 2x + 1}{x^4 + 2x^2 + 1}\ dx \ = \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad + \text{C}}$$

Hint: $x^4 + 2x^2 + 1 = (x^2 + 1)^2$.

5. $\int x^3 e^{x^2}\, dx \ =$ $\qquad\qquad\qquad\qquad$ $+ \mathrm{C}$

6. $$\boxed{\int \sin(\ln x)\ dx \ = \qquad\qquad\qquad\qquad\qquad\qquad + \text{C}}$$

Hint: bring to the other side idea.

7. $\displaystyle\int_0^e \frac{dx}{x-2} \;=$

HINT: $e \approx 2.7 > 2$