MARK BOX		
PROBLEM	POINTS	
1 a–e	25	
2 a–c	15	
3 a–c	15	
4 a–c	15	
5	5	
Total	75	
%	100	

Math 142.501 Prof. Girardi

Fall 98 Exam 2 10/29/98

NAME: _____

INSTRUCTIONS:

1. To receive credit you must:
   a. WORK IN A LOGICAL FASHION,
      SHOW ALL YOUR WORK,
      INDICATE YOUR REASONING.
   b. when applicable put your answer on/in the line/box provided
   c. if no such line/box is provided, then box your answer
   d. if you use your calculator, give an explanation of what you did on it.
2. The MARK BOX indicates the problems along with their points.
   Check that your copy of the exam has all of the problems.
3. During this test, do not leave your seat.
   If you have a question, raise your hand.
   When you finish: turn your exam over, put your pencil down, raise your hand.
4. This closed book/notes quiz covers (from *Calculus*, by Varberg and Purcell) :
   § 8.1 – 8.6 , 9.1 – 9.4 .

Problem Source:

1. look at problems § 8.6 sample test # 's 6, 37, 42, 41
   & look at problem § 8.? # 57

2a. look at problem § 8.? # 64 , also, an example from class

2b. look at problem § 8.? # 45 , also, an example from class

2c. look at problem § 9.4 # 44

3. look at problems: § 9.5 sample test #'s 7 & 15. an example from class.
4. look at problems: § 9.5 sample test #'s 31 & 33, § 9.3 # 17
5. concept comprehension indicator — suggested to me by a senior math major

1. Five integrals: **1a** − **1e** . ⊛ HINT: + C

1a. $\int \sin^3(2x)\, dx =$ _____ .

1b. $\int \frac{x}{\sqrt{x+5}}\, dx =$ _____ .

1c. $\displaystyle\int \frac{dx}{(16+x^2)^{3/2}} =$ _____ .

1d. $\displaystyle\int \frac{4x^2+3x+6}{x^2\left(x^2+3\right)}\,dx =$ _____ .

1e. Let a and b be nonzero constants.

$$\int e^{ax} \sin(bx)\, dx = \underline{\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad} .$$

2. Fun with Reduction Formulae **2a** − **2c** .

2a. Let α be a constant. Clearly show that

$$\int (\ln x)^{\alpha}\, dx \;=\; x\,(\ln x)^{\alpha} - \alpha \int (\ln x)^{\alpha-1}\, dx \;.$$

2b. Using **2a**, I see that $\int (\ln x)^2 \, dx \; = \;$ _____ .

2c. Find all real numbers b so that $\int_0^b \ln x \, dx \;=\; 0.$ ANSWER: _____ .

3. Three L'Hôpital-ers **4a** – **4c** .

3a. $\lim_{x\to\infty} \dfrac{\ln x}{x^2} =$ _____ .

3b. $\lim_{x\to\infty} \left(\dfrac{1}{\sin x} - \dfrac{1}{x}\right) =$ _____ .

3c. Let c be a constant. $\lim_{x\to\infty}\left(1+\frac{c}{x}\right)^x =$ _____ .

REMARK: Even if you remember the answer, show the work!

4. Three Improper Integrals **4a** – **4c**
If your answer is DOES NOT EXIST, specifically explain why.

4a. $\displaystyle\int_3^5 \frac{dx}{(4-x)^{2/3}} \;=\; \underline{\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad}\;.$

4b. $\displaystyle\int_{-\infty}^{\infty} \frac{x}{\sqrt{x^2+9}}\,dx \;=\; \underline{\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad}\;.$

4c. $\displaystyle\int_{-\infty}^{\infty} \frac{x}{x^2+1}\,dx \;=\;$ _____ .

5. Let $f\colon [0,14] \to \mathbb{R}$ and $g\colon [0,14] \to \mathbb{R}$ be two continuous functions, each differentiable on $(0,14)$. Also $g'(x) \neq 0$ for each $x \in (0,14)$. Cauchy Puffetto is moving along the curve $\mathcal{C}$ show below in such a way that his position at time t, where $0 \leqslant t \leqslant 14$, is (x,y) where $x = g(t)$ and $y = f(t)$. Estimate all points c, where $c \in (0,14)$, for which

$$\frac{f(14)-f(0)}{g(14)-g(0)} \;=\; \frac{f'(c)}{g'(c)}\ .$$

ESTIMATE(S) ON THE C('S): _____ .
Clearly geometrically explain your reasoning! One point for the correct estimate(s) and 4 points for your explanation.

more space provided ⟹

More space for # 5: