Math 120 Spring 2001 — Exam #2

6:30pm, Monday, March 26, 2001

Name: _____

Section (8:30am or 10:30am): _____

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1. There are five (5) questions on this exam. Each one involves both computations and interpretation. Read and answer each question carefully and fully. **Answers should be in complete sentences.**
2. The exam is scheduled to take 60 minutes (1 hour) but you have the full 3 hours to complete it.
3. Partial credit will be given, but only if we can see the correct parts. So **show all of your work**.
4. Recall the rules set out on the handout. Only your blue notes are allowed. Your blue notes must be handed in with your exam. When you are finished please sign the pledge below.
5. Relax and enjoy...and ask questions!

Pledge: I, _____, pledge my honor as a human being and Occidental student, that I have followed all the rules above to the letter and in spirit.

Problem:	Score:
1a	/6
1b	/7
1c	/7
1	/20
2a	/10
2b	/10
2	/ 20
3	/20
4	/20
5a	/4
5b	/4
5c	/4
5d	/8
5	/20
TOTAL:	/100

1. (*20 points*) Find an antiderivative for each of the following functions. Show the work you did to find the answer. CHECK YOUR ANSWER!

   a. (*6 points*) $f(t) = t^3 + \dfrac{1}{1+t^2}$, $\qquad F(t) =$

   b. (*7 points*) $g(t) = t^2 \ln(t)$, $\qquad G(t) =$

   c. (*7 points*) $h(t) = t^2 \cos(t^3)$, $\qquad H(t) =$

2. (*20 points*) Given the following information about an unknown function $g(x)$:

$$\int_1^2 \frac{g(u)}{u}\, du = 3, \quad \int_1^2 g(u)\, du = 4, \quad \int_1^4 g(u)\, du = 5$$

$$g(1) = 2, \quad g(2) = -2,$$

(a) Evaluate $I = \int_1^2 \ln(x) g'(x)\, dx$.

(b) Evaluate $J = \int_1^2 x g(x^2)\, dx$.

3. (*20 points*) This problem is about inverse functions. We know that if we have two functions f and g that are differentiable and that are inverse functions of each other, then the following statements are true:

   I. By definition, $f(g(x)) = x$.

   II. By definition, $g(f(x)) = x$.

   III. A property is $f'(x) = \dfrac{1}{g'(f(x))}$, provided $g'(f(x)) \neq 0$.

   IV. By definition, the graph of g can be obtained by reflecting the graph of f about the $y = x$ line.

   Consider the following pairs of functions

   Pair A: $f(x) = \dfrac{1}{x^2}$ and $g(x) = \dfrac{1}{\sqrt{x}}, \quad x > 0$

   Pair B: $f(x) = x$ and $g(x) = -x, \quad x > 0$

   Pair C: $f(x) = x$ and $g(x) = \dfrac{1}{x}, \quad x > 0$

   For EACH pair of functions, determine whether or not g and f are inverse functions of each other. Give reasons sufficient to support your conclusion in each case.

4. (*20 points*) Find the average value of the function $\sin^3(x)$ on $[-\pi/2, \pi/2]$.

   Hint: $\sin^2(x) = 1 - \cos^2(x)$. (If you cannot remember what the formula for the"average value of a function on an interval" is, we will "sell" this to you for 4 points.)

5. (*20 points*) Complete the following table. Make sure that you know which column contains derivatives and which column contains anti-derivatives. B, C and D are (known) positive constants. Check your work!!!

	$f'(x)$	$f(x)$	$\int f(x)\,dx$
1.	$2^x \ln(2)$	2^x	$\dfrac{2^x}{\ln(2)}$
2.		2^{3x}	
3.		3^{2x}	
4.		3^{2x+1}	
5.		B^{Cx+D}	
	$g''(x)$	$g'(x)$	$g(x)$