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MAT 266 Instructor: Ben Hester

TEST 1

Monday 9/28 or Tuesday 9/29, 2009

Honor Statement: By signing below you confirm that you have neither given nor received any unauthorized assistance on this exam. This includes any use of a graphing calculator beyond those authorized by the School of Mathematics and your instructor. Furthermore, you agree not to discuss this exam with anyone until the exam testing period is over and all tests have been returned. In addition, your calculator's program memory and menus may be checked at any time and cleared by any testing center proctor or instructor.

NAME: _____ **(PRINT!)**

Signed: _____

DIRECTIONS

1. This exam consists of 6 pages and 7 problems. Most problems are subdivided into sections like 1(a), 1(b), etc. Make sure your exam is complete before you begin.
2. No book or notes are allowed. No time limit.
3. SHOW ALL WORK in detail or your answer will not receive any credit.

No Calculators that do symbolic algebra (e.g. TI-89, TI-92, CASIO FX2 or 9970Gs are allowed.

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1. Evaluate the following indefinite integrals.

(a) (7 points) $\displaystyle\int \frac{\sin(\frac{1}{x})}{x^2}\,dx$

$\cos(1/x) + C.$

(b) (7 points) $\displaystyle\int te^{2t}\,dt$

$\frac{1}{2}te^{2t} - \frac{1}{4}e^{2t} + C.$

(c) (7 points) $\displaystyle\int \cos^2(2x)\sin^2(2x)\,dx$

$\frac{1}{8}x - \frac{1}{64}\sin(8x) + C.$

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(d) (7 points) $\int x^5 \ln(x)\, dx$

$\frac{1}{6}x^6 \ln(x) - \frac{1}{36}x^6 + C.$

(e) (7 points) $\int \frac{x-2}{x^2-4x+5}\, dx$

$\frac{1}{2}\ln(|x^2-4x+5|) + C.$

(f) (7 points) $\int \frac{x}{1+x^4}\, dx$

$\frac{1}{2}\tan^{-1}(x^2) + C.$

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(g) (7 points) $\int \sec^2(x)\tan^3(x)\,dx$

$\frac{1}{4}\tan^4(x) + C.$

2. (7 points) Find the <u>exact value</u> of the definite integral $\int_0^{\frac{\pi}{3}} \frac{\cos x}{1+\sin x}\,dx.$

$\ln(1+\sin(\pi/3)) = \ln(1+\sqrt{3}/2).$

3. (7 points) Evaluate $\int \frac{-3x+63}{x^2-3x-18}\,dx$

$5\ln(|x-6|) - 8\ln(|x+3|) + C.$

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4. (8 points) using the table below, integrate $\int \sqrt{7-6x-x^2}dx$.

$\int \sqrt{a^2+u^2}du = \frac{u}{2}\sqrt{a^2+u^2} + \frac{a^2}{2}ln\left|u+\sqrt{a^2+u^2}\right| + C$

$\int \sqrt{a^2-u^2}du = \frac{u}{2}\sqrt{a^2-u^2} + \frac{a^2}{2}arcsin(\frac{u}{a}) + C$

$\int \sqrt{u^2-a^2}du = \frac{u}{2}\sqrt{u^2-a^2} - \frac{a^2}{2}ln\left|u+\sqrt{u^2-a^2}\right| + C$

$$\frac{x+3}{2}\sqrt{16-(x+3)^2} + \frac{16}{2}\arcsin\left(\frac{x+3}{4}\right) + C.$$

5. (8 points) Evaluate the indefinite integral $\int \frac{dx}{x^2\sqrt{16x^2-9}}$.

$$\frac{\sqrt{16x^2-9}}{9x} + C.$$

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6. (12 points) Write out the form of the partial fraction decomposition of the following functions. Determine the numerical values of the coefficients. Then stop. Do not antidifferentiate

(a) $\dfrac{x^2}{(x-3)(x-4)^2}$

$$\frac{A}{x-3}+\frac{B}{x-4}+\frac{C}{(x-4)^2},$$

where $A=9$, $B=-8$, and $C=16$.

(b) $\dfrac{85}{(x+9)(x^2+4)}$

$$\frac{A}{x+9}+\frac{Bx+C}{x^2+4},$$

where $A=1$, $B=-1$, and $C=9$.

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7. (9 points) The values of a function are given below in the table.

x	0	1	2	3	4	5	6	7	8
$f(x)$	2	3	1	2	4	6	4	3	4

Approximate $\int_0^8 f(x)\,dx$ using $n = 4$ subintervals by finding:

(a) $\Delta x = 2$

(b) $L_4 = 22$

(c) $R_4 = 26$

(d) $M_4 = 28$

(e) $T_4 = 24$