MATH 142 (Section 502)
Prof. Meade

University of South Carolina
Fall 2008

Exam 2 — Retest
October 8, 2008

Name: ____________________
Section 502

Instructions:

1. There are a total of 5 problems (including the Extra Credit problem) on 7 pages. Check that your copy of the exam has all of the problems.
2. Calculators may not be used for any portion of this exam.
3. You must show all of your work to receive credit for a correct answer.
4. Your answers must be written legibly in the space provided. You may use the back of a page for additional space; please indicate clearly when you do so.

Problem	Points	Score
1	18	
2	20	
3	20	
4	20	
5	12	
Extra Credit	10	
Total	90	

Enjoy Fall Break!

1. (18 points) [3 points each] Determine if each statement is true or false.

(a) ______ To evaluate $\int x \tan(x)\, dx$, use a trigonometric substitution.

(b) ______ To evaluate $\int \frac{x+2}{x^2+4x+8}\, dx$, use a substitution $u = x^2 + 4x + 2$.

(c) ______ To evaluate $\int \frac{x+4}{x^2+4x+8}\, dx$, first complete the square in the denominator.

(d) ______ To evaluate $\int \frac{x^2}{\sqrt{4-x^2}}\, dx$, use the trigonometric substitution $x = 4\sin(\theta)$.

(e) ______ To evaluate $\int \sin^{13}(x)\, dx$, factor one power of $\sin x$ and use a double-angle formula.

(f) ______ To evaluate $\int x^2 \ln(x)\, dx$, use integration by parts with $u = x^2$.

2. (20 points) [10 points each] Evaluate each indefinite integral.

   (a) $\displaystyle\int 2y \arctan(y)\ dy$

   HINT: You might want to use $\frac{y^2}{1+y^2} = 1 - \frac{1}{1+y^2}$.

   (b) $\displaystyle\int \cos^3(2t) \sin^2(2t)\ dt$

3. (20 points) [10 points each] Evaluate each definite integral.

   (a) $\displaystyle\int_0^3 \sqrt{9 - x^2}\, dx$

   (b) $\displaystyle\int_{1/2}^{\sqrt{3}/2} \frac{(\arcsin(x))^2}{\sqrt{1 - x^2}}\, dx$

4. (20 points) [10 points each] Evaluate each indefinite integral.

   (a) $\int x^2 \sin(x)\, dx$

   (b) $\int \frac{dx}{x^3 + x}$

5. (12 points)

$$1.\quad \int \frac{du}{u\sqrt{a+bu}} = \frac{1}{\sqrt{a}} \ln \left| \frac{\sqrt{a+bu}-\sqrt{a}}{\sqrt{a+bu}+\sqrt{a}} \right| + C \qquad (a>0)$$

$$2.\quad \int \frac{\sqrt{a+bu}}{u}\, du = 2\sqrt{a+bu} + a \int \frac{du}{u\sqrt{a+bu}}$$

$$3.\quad \int \frac{\sqrt{a+bu}}{u^n}\, du = -\frac{(a+bu)^{3/2}}{a(n-1)u^{n-1}} - \frac{b(2n-5)}{2a(n-1)} \int \frac{\sqrt{a+bu}}{u^{n-1}}\, du$$

Use the above integral formulas to evaluate $\int \frac{\sqrt{4+u}}{u^2}\, du$.

Extra Credit (10 points)Derive one of the three formula from Question 5. Start by clearly indicating the formula you are going to derive by writing it on the top of this page. Be sure to show all of the steps.