MATH 142 (Section 502)
Prof. Meade

University of South Carolina
Fall 2008

Exam 2
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 $\int \dfrac{x+2}{x^2+4x+8}\, dx$, use a substitution $u = x^2 + 4x + 2$.

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

   (d) _____ To evaluate $\int \dfrac{x^2}{\sqrt{4-x^2}}\, dx$, 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) $\int 2y \arctan(y)\ dy$

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

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

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

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

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

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

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.