

Test is two sided.

Rip off this cover page and use it for scratch work.

MARK BOX		
PROBLEM	POINTS	
1	25	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
Extra Credit	5	
%	100	

NAME: _____

class PIN: _____

(* Extra Credit: 5 point for knowing your PIN number.

INSTRUCTIONS:

- (1) To receive credit you must:
 - (a) **work in a logical fashion, show all your work, indicate your reasoning;**
no credit will be given for an answer that *just appears*;
 such explanations help with partial credit
 - (b) if a line/box is provided, then:
 - show you work BELOW the line/box
 - put your answer on/in the line/box
 - (c) if no such line/box is provided, then box your answer
- (2) The MARK BOX indicates the problems along with their points.
 Check that your copy of the exam has all of the problems.
- (3) You may **not** use an electronic device, a calculator, books, personal notes.
- (4) During this exam, do not leave your seat. If you have a question, raise your hand. When you finish: turn your exam over, put your pencil down, and raise your hand.
- (5) This exam covers (from *Calculus* by Anton, Bivens, Davis 8th ed.):
 Sections 8.1, 8.2, 8.3, 8.4, 8.5, 8.8. .

Problem Inspiration: If I told you here, you would know what method to use. So see the solution key, which will be available from the course homepage after the exam.

Hints:

- (1) **You can check your answers to the indefinite integrals by differentiating.**
- (2) **For more partial credit, box your $u - du$ substitutions.**

Honor Code Statement

I understand that it is the responsibility of every member of the Carolina community to uphold and maintain the University of South Carolina's Honor Code.

As a Carolinian, I certify that I have neither given nor received unauthorized aid on this exam.

Furthermore, I have not only read but will also follow the above Instructions.

Signature : _____

1. Fill in the blanks (each worth 1 point).

- $\int \frac{du}{u} = \underline{\hspace{2cm}} |u| + C$
- If a is a constant and $a > 0$ but $a \neq 1$, then $\int a^u du = \underline{\hspace{2cm}} + C$
- $\int \cos u du = \underline{\hspace{2cm}} + C$
- $\int \sin u du = \underline{\hspace{2cm}} + C$
- $\int \tan u du = \underline{\hspace{2cm}} + C$
- $\int \cot u du = \underline{\hspace{2cm}} + C$
- $\int \sec u du = \underline{\hspace{2cm}} + C$
- $\int \csc u du = \underline{\hspace{2cm}} + C$
- $\int \sec^2 u du = \underline{\hspace{2cm}} + C$
- $\int \sec u \tan u du = \underline{\hspace{2cm}} + C$
- $\int \csc^2 u du = \underline{\hspace{2cm}} + C$
- $\int \csc u \cot u du = \underline{\hspace{2cm}} + C$
- If a is a constant and $a > 0$ then $\int \frac{1}{a^2+u^2} du = \underline{\hspace{2cm}} + C$
- If a is a constant and $a > 0$ then $\int \frac{1}{\sqrt{a^2-u^2}} du = \underline{\hspace{2cm}} + C$
- If a is a constant and $a > 0$ then $\int \frac{1}{u\sqrt{u^2-a^2}} du = \underline{\hspace{2cm}} + C$
- Partial Fraction Decomposition. If one wants to integrate $\frac{f(x)}{g(x)}$ where f and g are polynomials and $[\text{degree of } f] \geq [\text{degree of } g]$, then one must first do $\underline{\hspace{2cm}}$
- Integration by parts formula: $\int u dv = \underline{\hspace{2cm}}$
- Trig substitution: (recall that the *integrand* is the function you are integrating) if the integrand involves a^2+u^2 , then one makes the substitution $u = \underline{\hspace{2cm}}$
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- Trig substitution: if the integrand involves u^2-a^2 , then one makes the substitution $u = \underline{\hspace{2cm}}$
- trig formula ... your answer should involve trig functions of θ , and not of 2θ : $\sin(2\theta) = \underline{\hspace{2cm}}$.
- trig formula ... your answer should have $\cos(2\theta)$ in it: $\cos^2(\theta) = \frac{1}{2} (\underline{\hspace{2cm}})$.
- trig formula ... your answer should have $\cos(2\theta)$ in it: $\sin^2(\theta) = \frac{1}{2} (\underline{\hspace{2cm}})$.
- trig formula ... since $\cos^2 \theta + \sin^2 \theta = 1$, we know that the corresponding relationship between tangent (i.e., tan) and secant (i.e., sec) is $\underline{\hspace{2cm}}$.
- $\arcsin(-\frac{1}{2}) = \underline{\hspace{2cm}}$ **RADIANS**. (your answer should be an angle)

2.

$$\int e^{17x} dx =$$

+ C

3.

$$\int x e^x dx =$$

+ C

4.

$$\int \ln(x+2) dx =$$

+ C

5.

$$\int \sec^3 x \tan^3 x \, dx =$$

+ C

6.

$$\int \frac{x^2}{\sqrt{9-x^2}} dx =$$

+ C

7.

$$\int \frac{5x^3 - 3x^2 + 2x - 1}{x^4 + x^2} dx = \quad + C$$

HINT: $x^4 + x^2 = x^2(x^2 + 1) = (x - 0)^2(x^2 + 1)$

8. LaPlace Transform (from a homework problem)

A **transform** is a formula that converts, or *transforms*, one function into another function.

Consider a function of t , denoted by $y = f(t)$. The **LaPlace Transform** of this function $y = f(t)$ is a (new) function, namely the function

$$y = \mathcal{L}\{f(t)\} (s) ,$$

which is a function of s . The formula for the LaPlace Transform of $y = f(t)$ is

$$\mathcal{L}\{f(t)\} (s) = \int_{t=0}^{t=\infty} e^{-st} f(t) dt . \quad (8)$$

where, in the integral in (8) above, s is treated as a constant.

The LaPlace Transform of the function

$$f(t) = e^{2t}$$

is the function

$\mathcal{L}\{f(t)\} (s) =$ for $s > 2$.

Hint: thus, if $f(t) = e^{2t}$, then by equation (8),

$$\mathcal{L}\{f(t)\} (s) = \int_{t=0}^{t=\infty} e^{-st} f(t) dt = \int_{t=0}^{t=\infty} e^{-st} e^{2t} dt$$
