

MARK BOX		
PROBLEM	POINTS	
1 a-y	25	
2	10	
3	11	
4	11	
5	11	
6	11	
7	11	
8 take home	10	
9 extra credit take home	2	
%	100	

NAME: _____

please check the box of your section

Section 005 (WF 8:00 am)

or

Section 006 (WF 9:05 am)

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 your 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 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 8.2, 8.3, 8.4, 8.5, 8.7, 8.8. .

Problem Inspiration:

1. You were warned.
2. An example from class.
3. Handout of 100 integrals # 7
4. Handout of 100 integrals # 23
5. Handout of 100 integrals # 47
6. Handout of 100 integrals # 26
7. Handout of 100 integrals - 4th page
8. just like the homework.
9. Section 8.8, number 16.

Hints:

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

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

1a. $\int \frac{du}{u} = \underline{\hspace{2cm}} |u| + C$

1b. If a is a constant and $a > 0$ but $a \neq 1$, then $\int a^u du = \underline{\hspace{2cm}} + C$

1c. $\int \cos u du = \underline{\hspace{2cm}} + C$

1d. $\int \sec^2 u du = \underline{\hspace{2cm}} + C$

1e. $\int \sec u \tan u du = \underline{\hspace{2cm}} + C$

1f. $\int \sin u du = \underline{\hspace{2cm}} + C$

1g. $\int \csc^2 u du = \underline{\hspace{2cm}} + C$

1h. $\int \csc u \cot u du = \underline{\hspace{2cm}} + C$

1i. $\int \tan u du = \underline{\hspace{2cm}} + C$

1j. $\int \cot u du = \underline{\hspace{2cm}} + C$

1k. $\int \sec u du = \underline{\hspace{2cm}} + C$

1l. $\int \csc u du = \underline{\hspace{2cm}} + C$

1m. If a is a constant and $a > 0$ then $\int \frac{1}{\sqrt{a^2-u^2}} du = \underline{\hspace{2cm}} + C$

1n. If a is a constant and $a > 0$ then $\int \frac{1}{a^2+u^2} du = \underline{\hspace{2cm}} + C$

1o. If a is a constant and $a > 0$ then $\int \frac{1}{u\sqrt{u^2-a^2}} du = \underline{\hspace{2cm}} + C$

1p. 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 $\underline{\hspace{2cm}}$

1q. Integration by parts formula: $\int u dv = \underline{\hspace{2cm}}$

1r. 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 $u = \underline{\hspace{2cm}}$

1s. Trig substitution:
if the integrand involves a^2+u^2 , then one makes the substitution $u = \underline{\hspace{2cm}}$

1t. Trig substitution:
if the integrand involves u^2-a^2 , then one makes the substitution $u = \underline{\hspace{2cm}}$

1u. trig formula ... your answer should involve trig functions of θ , and not of 2θ : $\sin(2\theta) = \underline{\hspace{2cm}}$.

1v. trig formula ... $\cos(2\theta)$ should appear in the numerator: $\cos^2(\theta) = \frac{\underline{\hspace{2cm}}}{2}$.

1w. trig formula ... $\cos(2\theta)$ should appear in the numerator: $\sin^2(\theta) = \frac{\underline{\hspace{2cm}}}{2}$.

1x. 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 $\underline{\hspace{2cm}}$.

1y. $\arcsin\left(-\frac{\sqrt{2}}{2}\right) = \underline{\hspace{2cm}}$ **RADIANS.** (your answer should be an angle)

2.

$$\int_{x=17}^{x=\infty} \frac{1}{x^2} dx =$$

3.

3a. $D_x \tan x =$

3b. $D_x \sec x =$

3c. $\int \tan^2 x \, dx =$ + C

Hint: problems 1x, 3a, and 3b might come in handy for problem 3c.

4.

$$\int \ln(3x + 6) \, dx = \quad \quad \quad + C$$

Hint: be clever in your choice of v to avoid unneeded work.

Note that $\frac{3}{3x+6} = \frac{3}{3(x+2)} = \frac{1}{x+2}$

5.

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

Hint: $x^5 + x^4 = (x^4)(x + 1) = (x - 0)^4 (x + 1)^1$.

6.

$$\int \frac{x^2}{\sqrt{16-x^2}} dx = \qquad + C$$

Hint: problems 1 u - w might come in handy.

7.

$$\int \csc^3 x \, dx = \qquad \qquad \qquad + C$$

Hint: bring to the other side idea, similar to how to do $\int \sec^3 x dx$. Helpful:

- $D_x \cot x = -\csc^2 x$
- $D_x \csc x = -\csc x \cot x$
- $\cot^2 x + 1 = \csc^2 x$.

8. Numerical Integration . Let

$$I = \int_{x=1}^{x=3} \frac{1}{x^2} dx .$$

The 10 steps of this problem are similar to the homework but the number of subintervals is **6** and **not 10**. **On the parts that say “Do not use a calculator”, you need not do alot of arthritic.**

8-1.Find the exact value of I , without using a calculator. Your answer should be a fraction, without decimal places.

$$I =$$

8-2.Find an approximation for I , using part 1 and your calculator, to as many decimal places as your calculator will give you.

$$I \approx$$

8-3.Approximate I using the Trapezoid Rule T_n with $n = 6$ subintervals. Do not use a calculator (so your answer will have several numbers added together).

$$T_6 =$$

8-4.Find an approximation for T_6 , using part 3 and your calculator, to as many decimal places as your calculator will give you.

$$T_6 \approx$$

8-5. Approximate I using Simpson's Rule S_{2n} with $2n = 6$ subintervals. Do not use a calculator (so your answer will have several numbers added together).

$$S_6 =$$

8-6. Find an approximation for S_6 , using part 5 and your calculator, to as many decimal places as your calculator will give you.

$$S_6 \approx$$

8-* Find the first 4 derivatives of $f(x) = x^{-2}$.

8-7. Use inequality (11), page 563, to find an upper bound on the error in part 3. Do not use a calculator.

$$|T_6 - I| \leq$$

8-8. Use your calculator to approximate the error estimate in part 7 to as many decimal places as your calculator will give you.

$$|T_6 - I| \approx$$

8-9. Use inequality (12), page 563 to find an upper bound on the error in part 5. Do not use a calculator.

$$|S_6 - I| \leq$$

8-10. Use your calculator to approximate the error estimate in part 9, to as many decimal places as your calculator will give you.

$$|S_6 - I| \approx$$

9. Extra Credit - number 16 from section 8.8.

$$\int_{x=-\infty}^{x=\infty} \frac{e^{-x}}{1 + e^{-2x}} dx =$$