Your Name

Signature (you agree to complete honestly)

Student ID #

Start Time

End Time

Page	Total Points	Score
2	16	
3	16	
4	16	
5	16	
6	20	
7	16	
8	4 (e.c.)	
Total	100	

- You will have 90 minutes to complete the exam.

- This test is closed book and you may not use a calculator.

- You may use one side of a single piece of paper (8 1/2 in. x 11 in.) of handwritten notes.

- In order to receive full credit (or partial credit in the case of incorrect solutions), you must **show your work.** Please write out your computations on the exam paper.

- Simplify all obvious expressions.

- **PLACE A BOX AROUND** YOUR FINAL ANSWER **to each question** where appropriate.

(16 points, 8 points each) Evaluate the following integrals.

1. $\displaystyle\int_0^\pi x \sin(3x)\, dx$

2. $\displaystyle\int \cos^3(2\theta) \sin^2(2\theta)\, d\theta$

(16 points, 8 points each) Evaluate the following integrals.

3. $\displaystyle\int (\cos(3t) - 1)^2 \, dt$

4. $\displaystyle\int \frac{2}{\sqrt{9x^2 - 1}} \, dx$

(8 points) Evaluate the following integral.

5. $\displaystyle\int \ln(4x)\, dx$

6. (4 points) Consider the integral $\displaystyle\int \frac{4}{9-x^2}\, dx$. This integral can be evaluated using two different techniques from Ch. 7. What are those two techniques, and why will they work? [In other words, what do you recognize in the integral that would allow you to use the two techniques?] There is absolutely no need to evaluate the integral using either technique.

7. (4 points) Write out the form of the partial fraction decomposition of the function $f(x) = \dfrac{x^2 + 2x + 1}{x(x-1)^3(x^2+2)^2}$.

   Do not determine the numerical values of the coefficients.

(16 points, 8 points each) Evaluate the following integrals.

8. $\displaystyle\int \frac{2x^2-5}{x(x-1)^2}\,dx$

9. $\displaystyle\int \frac{e^{2x}}{e^{2x}-7e^x+12}\,dx$

10. (4 points) Are the following integrals improper? Why or why not? **You do not need to determine whether the integral converges or diverges.**

(a) $\int_1^2 \frac{x}{x-1} dx$

(b) $\int_0^2 \frac{dx}{x^2 - 2x - 3}$

(16 points, 8 points each) Determine whether each integral is convergent or divergent. Evaluate those that are convergent. Clearly explain why the integral diverges, if applicable.

11. $\int_4^8 \frac{1}{(x-4)^{3/2}} dx$

12. $\int_3^\infty 9x^2 e^{-x^3} dx$

13. (16 points) Set up an expression that approximates the integral $\int_1^3 x^2 \ln x \, dx$ with $n = 4$ using the technique specified below. Your final expression should be something that could be plugged into a calculator to get a numerical answer.

   (a) (4 points) Midpoint Rule.

   (b) (4 points) Trapezoid Rule.

   (c) (4 points) Simpson's Rule.

   (d) (4 points) Approximate (and simplify if possible) the error, E_S, involved in the approximation from part (a) above. Note that you may find the table of derivatives below useful. **You must explain your work to receive full credit.**

Some Derivatives
$f(x) = x^2 \ln x$
$f'(x) = x + 2x \ln x$
$f''(x) = 3 + 2 \ln x$
$f'''(x) = 2/x$
$f^{(4)}(x) = -2/x^2$

14. **(4 points Extra Credit)**: Evaluate $\displaystyle\int \frac{x^2}{x^6 + 9}\,dx$