Exam 2 Name: _____

Directions: Answer each question to the best of your ability. The point value of each question follows the question. Calculators are allowed, but you must show appropriate work to receive full credit. Choose the best response for the following 5 questions. (4 pts each)

1. Which is the correct use of substitution for the definite integral, $\int_{\frac{\pi}{2}}^{\pi} \cos^2 x \sin x \, dx$

   (a) $-\int_{\frac{\pi}{2}}^{\pi} u^2 \, du$

   (b) $\int_{\frac{\pi}{2}}^{\pi} u^2 \, du$

   (c) $-\int_{0}^{-1} u^2 \, du$

   (d) $\int_{0}^{-1} u^2 \, du$

2. How many applications of the integration by parts method are necessary to solve $\int x^4 \sin x \, dx$?

   (a) 2

   (b) 4

   (c) 6

   (d) This integral cannot be solved by the integration by parts method

3. Which approximation always give an overestimate of $\int_a^b f(x) \, dx$ when $f''(x) < 0$

   (a) Left-hand Rule

   (b) Right-hand Rule

   (c) Midpoint Rule

   (d) Trapezoid Rule

4. Given that
$$\lim_{x \to \infty} f(x) = 0$$
   and a is a constant, $\int_a^{\infty} f(x) \, dx$:

   (a) Always diverges.

   (b) Always converges.

   (c) Convergence or divergence depends on $f(x)$.

   (d) No determination regarding divergence or convergence can be made.

5. Approximating an integral with 8 subdivisions gives an error of 5. Approximating the same integral with the same rule with 80 subdivisions gives an error of .05. Which approximation rule was used?

   (a) Left-hand Rule

   (b) Right-hand Rule

   (c) Midpoint Rule

   (d) Simpson's Rule

6. Following are methods of finding integral that we have studied along with the necessary information we have to identify. Given the integrals, find the appropriate method of integration and identify the relevant information for that method. use numerical only when all other options fail. Assume a and b are constants.

Method	Information to Identify
Elementary integral	None (we can take integral directly)
Substitution	O.F.=$f(u)$; I.F. = $u = f(x)$; $du = f'(x)dx$
Integration by Parts	$u =$ $v' =$ $u' =$ $v =$
Integration by Partial Fractions	Decompose fraction into sum
Numerical Approximation	None (must use one of 5 numerical methods)

Integral	Method (2 pts each)	Necessary Information for the method (3 pts each)
$\int_a^b x^5 e^x \, dx$		
$\int_a^b x^3 e^{x^4} \, dx$		
$\int_a^b \frac{1}{1+x^2} \, dx$		
$\int_a^b \frac{\sin^2 x}{x^2} \, dx$		
$\int_a^b \frac{2x+1}{x^2-2x-3} \, dx$		

Find each of the following integrals. Don't forget to show all work. Clearly identify the integration method used and necessary information. Please keep your work neat and organized. You may choose to not do one of the three problems 7, 8, or 9. You may do all three for possible 5 pts. extra credit. (5 pts each)

7. $\int x^2 e^{2x^3-5}\,dx$

8. $\int e^x \cos 4e^x\,dx$

9. $\int \frac{x+5}{x^2+10x-11}\,dx$

10. $\int x^8 \ln x \, dx$

11. $\int \frac{3x+8}{x^2+7x+6}$

12. Identify each of the following integrals as either improper or not improper. (1 pt each)

    (a) $\int_1^4 \frac{1}{x^4}\,dx$

    (b) $\int_{-1}^1 \frac{1}{x^3+1}\,dx$

    (c) $\int_1^\infty \frac{1}{x}\,dx$

    (d) $\int_0^7 \frac{1}{x^2-4}\,dx$

    (e) $\int_{-1}^2 \frac{1}{x+2}\,dx$

13. Determine if the following integrals converge or diverge. If it converges, find the value. Again, don't forget to show your work using limits. (5 pts each)

    (a) $\int_0^1 \frac{2}{\sqrt[4]{x}}\,dx$

    (b) $\int_2^\infty \frac{5}{\sqrt[3]{x}}\,dx$

14. An object moves with velocity, $v(t) = \frac{1}{5}t^3e^t$

(a) Complete the table below (1 pt each)

t	0	1	2	3	4
$v(t)$					

Estimate the total distance traveled from 0 to 4 using the following rules with the number of subdivisions in parentheses. Remember, distance $= \int_0^4 v(t)\,dt$

(a) Trapezoid Rule(2) (5 pts)

(b) Midpoint Rule(2) (5 pts)

(c) Simpson's Rule(4) (5 pts)