

Exam 2

There are 100 points possible. Calculators may be used on some questions. To receive full credit, you **must** show all work! Answers without any work will be given little if any credit.

1. (12 pts.) Answer the following questions by circling **TRUE** or **FALSE**. BE CAREFUL in choosing your answer. No explanation necessary.

(a) **TRUE** or **FALSE** If f and g are continuous functions on $[a, b]$, then $\int_a^b \frac{f(x)}{g(x)} dx = \frac{\int_a^b f(x) dx}{\int_a^b g(x) dx}$.

(b) **TRUE** or **FALSE** The Table of Integrals can be used to find $\int \frac{x}{\sqrt{x^2 - 1}} dx$.

(c) **TRUE** or **FALSE** If $f(x) \leq g(x)$ for all $x \geq 0$ and $\int_0^\infty g(x) dx$ diverges, then $\int_0^\infty f(x) dx$ diverges.

(d) **TRUE** or **FALSE** If F is an antiderivative for f on $[0, \infty)$, then $\int_0^\infty f(x) dx = F(\infty) - F(0)$.

2. (12 pts.) Use a Trigonometric Substitution to evaluate $\int \frac{\sqrt{x^2 - 9}}{x} dx$.

3. (10 pts.) Use Integration by Parts to show that $\int x^2 \ln x \, dx = \frac{x^3}{9}(3 \ln x - 1) + C$.

4. (10 pts.) Without using the Table of Integrals, evaluate $\int \sin^3 x \cos^2 x \, dx$.

5. (10 pts.) Use Partial Fractions to evaluate $\int_4^8 \frac{x}{x^2 - 2x - 3} \, dx$. Give the **EXACT** answer.

6. (11 pts.) Determine, with explanation, whether $\int_0^{\infty} \frac{e^x}{e^{2x} + 3} dx$ is convergent or divergent. If it is convergent, find its **exact** value.

7. (11 pts.) Use Simpson's Rule with $n = 10$ to approximate $\int_0^1 \cos(x^2) dx$.

8. (24 pts.) Evaluate each of the following integrals BY HAND. This means that you may only use your calculator AS A CHECK; however, you may use the Table of Integrals.

(a) $\int \frac{\sqrt{5 - 4x^2}}{x} dx$

(b) $\int \frac{x}{\sqrt{x^4 - 3}} dx$

(c) $\int e^{\sqrt{x}} dx$ (**Hint:** Make a substitution.)