

Name: _____

Worksheet #7 / Mock Exam #1

Math 231 AD1

1. Compute $\int 3x \sin(5x) dx$.

2. Compute $\int \frac{x^3 + x - 1}{x^2 - 1} dx$.

3. Consider the integral $\int_{-1}^7 f(x) dx$.

(a) Fill in the blanks: $M_4 = \underline{\hspace{1cm}}(\underline{\hspace{1cm}} + \underline{\hspace{1cm}} + \underline{\hspace{1cm}} + \underline{\hspace{1cm}})$.

(b) Fill in the blanks: $T_4 = \underline{\hspace{1cm}}(f(-1) + \underline{\hspace{1cm}} + \underline{\hspace{1cm}} + \underline{\hspace{1cm}} + \underline{\hspace{1cm}})$.

4. Compute $\int \sin^3(x) \sec^4(x) dx$.

5. Compute $\int \frac{1}{4x^2 + 1} dx$.

6. Write the partial fraction decomposition of $\frac{3x^6 - 4x^2 + 61}{x^6 - x^2}$. *Don't* find the coefficients.

7. Compute $\int e^{\sqrt{x}} dx$.

8. What is the volume obtained by rotating the graph of $\frac{1}{x}$ from 1 to ∞ about the x -axis?

9. Evaluate (or prove divergent) $\int_0^2 \frac{2}{x^2 - 1} dx$.

10. Use the comparison test to determine whether $\int_1^\infty \frac{e^{-x}}{x} dx$ converges or diverges.

11. For any continuous function f on $[a, b]$, $S(f)$ will approximate $\int_a^b f(x)dx$ to an error of no more than $\frac{K(b-a)^5}{180}$ where $|f^{(4)}(x)| \leq K$ for all x in $[a, b]$. You use $S(f)$ to numerically approximate the integral $\int_{-1}^0 3e^x dx$ by subdividing the integral into n equal pieces and applying $S(f)$ to each of these intervals. What is an upper bound on the error of your approximation and why?

12. Consider the integral $\int_1^2 \frac{4}{3}e^{x^2} dx$. Simplify all answers. You may use that $e^4 < 64$.

- (a) Estimate the midpoint approximation error of $|E_M|$ with $n = 10$.
- (b) Estimate the trapezoidal approximation error of $|E_T|$ with $n = 20$.
- (c) Find n such that $|E_M| \leq 0.01 = 10^{-2}$.
- (d) Find n such that $|E_T| \leq 0.0002 = 2 \cdot 10^{-4}$.