MAT 271 Test 2
Instructor: John Quigg

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<th>Score</th>
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Honor Statement: I have not received, nor will I give, any information regarding this exam before it is returned graded by the instructor.

Signed __________________________

- Time limit: 1.5 hours (90 minutes).
- No notes, books, or calculators.
- You must show all your work to receive credit.
- Your solutions must be complete and organized, and your final answer must be clearly indicated.
- Write your solutions on blank pages obtained from the Testing Clerk, on one side only, leaving a 1-inch margin on all sides, and put your name at the top right corner of every page.
- This exam has 2 pages.
- All problems have equal credit.
- Turn in your exam face up, with the exam question page(s) on top. If you do not have a stapler, the exam clerk will staple the exam; do not fold the corner of the exam over.

1. Find the integral:

\[
\int \frac{dx}{2x^2 + 4x + 4}
\]
2. Some values of a function $f$ are given in the table below. In each part of this problem, use the indicated rule with the indicated value of $n$ to approximate $\int_1^9 f(x) \, dx$ 

<table>
<thead>
<tr>
<th>$x$</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>2</td>
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(a) Simpson’s Rule with $n = 4$.  
(b) The Midpoint Rule with $n = 2$. 

3. Find the integral: 

$$\int \frac{dx}{x + 7 - 5\sqrt{x + 1}}$$ 

4. Find the integral: 

$$\int_0^{\pi/3} \tan^5 x \sec x \, dx$$ 

5. The error ET in approximating an integral $\int_a^b f(x) \, dx$ using the Trapezoid Rule with $n$ subintervals satisfies the inequality 

$$|ET| \leq \frac{K(b - a)^3}{12n^2},$$ 

where $K$ is any constant such that 

$$|f''(x)| \leq K \quad \text{for} \ a \leq x \leq b.$$ 

Using this error estimate, find the smallest value of $n$ required to guarantee that the error in approximating 

$$\int_2^3 3 \ln 5x \, dx$$ 

using the Trapezoid Rule has absolute value less than 0.01 (=$\frac{1}{100}$). Note: do not evaluate the integral itself, or make any substitution. 

6. Find the integral: 

$$\int x^2 e^{3x} \, dx$$ 

7. Write the form of the partial fraction expansion, but do not find the values of the constants: 

$$\frac{x^4 + 1}{x^4 + x^3 + x^2}$$ 

8. Find the integral: 

$$\int \sqrt{1 - x^2} \, dx$$