1. Find \( \int \frac{3x^4 - 21x^3 + 7x^2 - 48x + 21}{x^2 - 7x} \, dx \). Show all your steps.

2. Find \( \int \frac{4x + 8}{x^2 + 20x + 200} \, dx \) by the methods we have discussed in class. Show all your steps.
3. Suppose the change in temperature in degrees per hour of an object is measured and the results put into a table as follows:

<table>
<thead>
<tr>
<th>time</th>
<th>1:30</th>
<th>1:40</th>
<th>1:50</th>
<th>2:00</th>
<th>2:10</th>
<th>2:20</th>
<th>2:30</th>
<th>2:40</th>
<th>2:50</th>
<th>3:00</th>
<th>3:10</th>
<th>3:20</th>
<th>3:30</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(t)</td>
<td>5.5</td>
<td>7.5</td>
<td>8.7</td>
<td>9.0</td>
<td>8.6</td>
<td>7.4</td>
<td>5.4</td>
<td>2.6</td>
<td>-1.0</td>
<td>-5.4</td>
<td>-10.6</td>
<td>-16.6</td>
<td>-23.4</td>
</tr>
</tbody>
</table>

a. What does the integral \( \int_{2:00}^{3:00} D(t) \, dt \) represent?

b. Find each of the following estimates of the integral in (a) using only the information in the table. If the table doesn’t supply the information needed, explain why not.

TRAP(3)

MID(6)

SIMP(3)

TRAP(12)

c. Is LHS(3) an under- or over-approximation of the integral in (a)? Explain!

d. Is MID(3) an under- or over-approximation of the integral in (a)? Explain!
4. Use substitution to find the following integral. Show the limits of integration as they appear on the (new) integral once the substitution has been made. 

\[ \int_{1}^{4} \frac{\cos(\sqrt{x} + 5)}{\sqrt{x}} \, dx \]

5. Use integration by parts to find \( \int \ln(q^8)q^5 \, dq \). Hint: Use the formula \( \ln(A^B) = B \cdot \ln(A) \) to good advantage.
6. Use integration by parts to find \[ \int \frac{2x + 3}{\sqrt{5x - 7}} \, dx. \]

7. Determine if the following integral converges, and if so find the value, using the “limit definition” discussed in class. Support your conclusion with a table of values showing what happens as \( B \to \infty \).
\[
\int_{1}^{\infty} \frac{e^{1/x}}{x^2} \, dx.
\]
8. Use the tables of integrals to find these integrals. No need to simplify your answers:

8a. \[ \int \frac{3x^2 + 4x + 8}{e^{2x}} \, dx \]

8b. \[ \int \frac{e^x}{\sin e^x} \, dx \]