2. [14 points] Let \( f(x) \) be a continuous function on \( 0 \leq x \leq 2 \). The values of \( f(x) \) are shown below

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>-3</td>
<td>-2</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

a. [2 points] Use the left-hand sum with four subintervals to approximate the value of \( \int_0^2 f(x) \, dx \). Show all the terms in the sum, and then calculate the numerical value.

b. [2 points] Assume that \( f(x) \) has no critical points for \( 0 \leq x \leq 2 \). Is your estimate in (a) guaranteed to be an underestimate or overestimate of \( \int_0^2 f(x) \, dx \), or there is not enough information to decide? Justify.

c. [2 points] Use the trapezoid rule with four subintervals to approximate the value of \( \int_0^2 f(x) \, dx \). Show all the terms in the sum, and then calculate the numerical value.

d. [2 points] Given the data for \( f(x) \), is your estimate in (c) guaranteed to be an underestimate or overestimate of \( \int_0^2 f(x) \, dx \), or there is not enough information to decide? Justify.
e. [2 points] Consider the function $g(x)$ whose graph is shown below

Use the midpoint rule with three subintervals to approximate the value of $\int_0^6 g(x) \, dx$. Show all the terms in the sum, and then calculate the numerical value.

f. [2 points] Use the right-hand sum with three subintervals to approximate the value of $\int_1^3 e^{\sqrt{t}} \, dt$. Show all the terms in the sum, and then calculate the numerical value.

g. [2 points] Is your estimate in (f) guaranteed to be an underestimate or overestimate of $\int_1^3 e^{\sqrt{t}} \, dt$, or there is not enough information to decide? Justify.