1. The table below gives the expected growth rate, \( g(t) \), in ounces per week, of the weight of a baby in its first 54 weeks of life (which is slightly more than a year). Assume for this problem that \( g(t) \) is a decreasing function.

<table>
<thead>
<tr>
<th>week ( t )</th>
<th>0</th>
<th>9</th>
<th>18</th>
<th>27</th>
<th>36</th>
<th>45</th>
<th>54</th>
</tr>
</thead>
<tbody>
<tr>
<td>growth rate ( g(t) )</td>
<td>6</td>
<td>6</td>
<td>4.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

a. Using four subdivisions, find an overestimate and underestimate for the total weight gained by a baby over its first 36 weeks of life.

b. How frequently over the 54 week period would you need the data for \( g(t) \) to be measured to find overestimates and underestimates for the total weight gain over this time period that differ by \( 1/16 \) lb (1 oz)?
2. a. Using 4 equal subdivisions, find a Riemann sum which is an overestimate for \( \int_{2}^{4} \ln(x) \, dx \).

b. Sketch a graphical representation of your Riemann sum, and write “LHS” or “RHS” next to your figure to indicate whether you are using a left-hand sum or a right-hand sum. Write out the terms of the Riemann sum using exact values (i.e., in terms of \( \ln \) and not decimal approximations from your calculator).

c. Show that \( F(x) = x \ln(x) - x + C \) is an antiderivative for \( \ln(x) \), where \( C \) is any constant. In other words, show \( F'(x) = \ln(x) \).

d. Using Part c, find the exact value of the integral \( \int_{2}^{4} \ln(x) \, dx \).
3. The NASA Q36 Robotic Lunar Rover can travel up to 3 hours on a single charge and after \( t \) hours of traveling, its speed is \( v(t) \) miles per hour given by the function \( v(t) = \sin(\sqrt{9 - t^2}) \).

a. Write an integral that expresses the distance traveled by the Q36 during its first two hours of operation.

b. How many terms would be required in a Riemann sum for your integral in part a to be accurate to within 50 feet (i.e., 0.0947) miles?

c. Use your calculator to compute an overestimate for your integral in part a accurate to within 50 feet (i.e., 0.0947) miles. Write both the calculator command and the answer below.
4. Find the average value of \( f(x) = x^2 \) between \( x = 1 \) and \( x = 10 \).