3. [12 points] Virgil, Duncan, Jasper and Zander are all watching a toy wind-up mouse move across the floor. Their person places the toy on the floor 2.3 meters away from Virgil, and it moves in a straight line directly away from Virgil at a strictly decreasing velocity. Below are some values of $v(t)$, the velocity of the toy mouse, in meters per second, $t$ seconds after the person places it on the floor, where a positive velocity corresponds to the toy moving away from Virgil.

<table>
<thead>
<tr>
<th>$t$</th>
<th>0</th>
<th>0.25</th>
<th>0.5</th>
<th>0.75</th>
<th>1</th>
<th>1.25</th>
<th>1.5</th>
<th>1.75</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v(t)$</td>
<td>3.19</td>
<td>2.39</td>
<td>1.86</td>
<td>1.43</td>
<td>1.11</td>
<td>0.86</td>
<td>0.54</td>
<td>0.42</td>
<td>0.11</td>
</tr>
</tbody>
</table>

a. [4 points] Estimate the value of $\int_{0.25}^{1.75} v(t) \, dt$ using a left-hand Riemann sum with $\Delta t = 0.5$. Be sure to write down all the terms in your sum. Is your answer an over- or underestimate?

Answer: ____________________________

This is (circle one):

AN OVERESTIMATE     AN UNDERESTIMATE     NOT ENOUGH INFORMATION

b. [3 points] How often should the values of $v(t)$ be measured in order to find upper and lower estimates for $\int_{0.25}^{1.75} v(t) \, dt$ that are within 0.1 m of the actual value?

Answer: ____________________________

c. [2 points] Find the value of $\int_{0.5}^{1.25} v'(t) \, dt$.

Answer: ____________________________

d. [3 points] Which of the following represents how much the distance from the toy mouse to Virgil increases during the 2nd second after it has been placed on the floor? Circle the best answer.

i. $2.3 - \int_{1}^{2} v(t) \, dt$

ii. $2.3 - \int_{1}^{2} v'(t) \, dt$

iii. $\int_{1}^{2} v(t) \, dt - \int_{0}^{1} v(t) \, dt$

iv. $\int_{1}^{2} v(t) \, dt$

v. $\int_{1}^{2} v'(t) \, dt$

vi. $v(2) - v(1)$