NAME:

Show ALL your work CAREFULLY.

The graph shown below is that of the velocity $v(t)$ of an object (in meters/second) traveling along a straight line.

(a) Using 5 subintervals, find the Right Hand Sum for the total distance traveled from $t = 0$ to $t = 5$ seconds.

First, we let $t_0 = 0, t_1 = 1, t_2 = 2, t_3 = 3, t_4 = 4,$ and $t_5 = 5$. The Right Hand Sum is then

$$\sum_{i=1}^{5} v(t_i) \cdot \Delta t$$

where $\Delta t = (5 - 0)/5 = 1$. It follows that the Right Hand Sum is equal to

$$[v(1) + v(2) + v(3) + v(4) + v(5)] \cdot 1 = 2 + 2 + 0 + (−2) + (−2) = 0.$$
(b) What is the average velocity of this object during \( t = 0 \) and \( t = 5 \)? [First, you must find the exact value of the total distance traveled.]

The exact value of the total distance traveled is given by the definite integral

\[
\int_{0}^{5} v(t) \, dt
\]

or, equivalently the signed area between the graph of \( v(t) \) and the \( t \)-axis over the interval \([0, 5]\). One finds the signed area to be equal to 1. Thus the average velocity is equal to

\[
\frac{1}{5 - 0} \int_{0}^{5} v(t) \, dt = \frac{1}{5}.
\]

(c) Find the exact value of

\[
\int_{2}^{5} v(t) \, dt.
\]

Just like part (b), this definite integral is equal to the signed area between the graph of \( v(t) \) and the \( t \)-axis over the interval \([2, 5]\). This signed area is equal to \(-2\).