

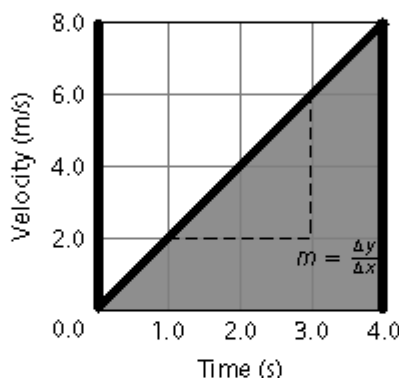
ACTIVITY

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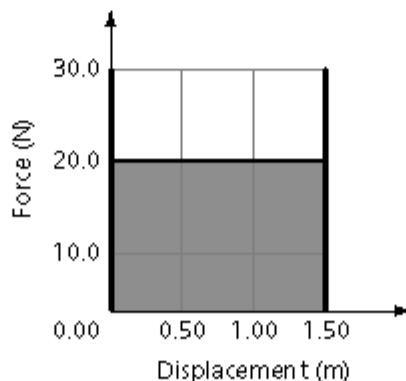
Connecting Math to Physics

The Area Under a Graph

Graphs are used throughout your textbook to visualize the relationships between variables. An important attribute of a graphed curve is the area under the curve. In calculus, this area is called an integral. Areas above the x -axis are positive, and areas below the x -axis are negative. Usually, we are concerned with the area under a curve and between two vertical lines. Those vertical lines may or may not be grid lines on the graph.



In the figure above, the shape is a triangle where $A = (1/2)bh = 1/2 \times 4.0 \text{ s} \times 8.0 \text{ m/s} = 16 \text{ m}$. Notice that the unit for vt is the meter. Therefore, the integral of a v - t graph is always equal to the displacement, d . The unit that results from the multiplication of the x -axis value and the y -axis value indicates the variable that the integral is equal to. In the figure below showing an F - d graph, the integral of the graph is the area of the rectangle $A = bh = 1.5 \text{ m} \times 20 \text{ N} = 30 \text{ N m} = 30 \text{ J}$. The unit for Fd is the joule. Therefore, the integral of the F - d graph is equal to the amount of work done.

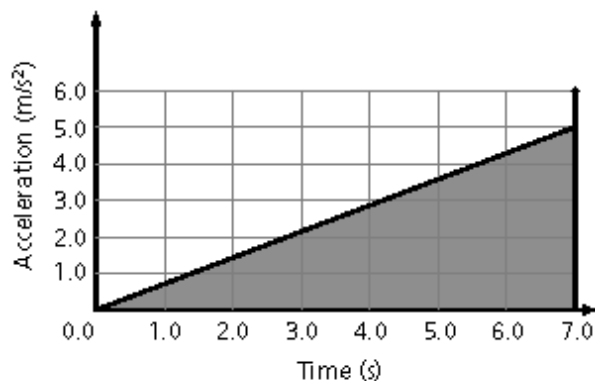


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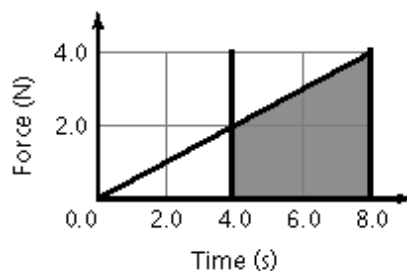
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For each of the following exercises, find the integral and indicate the variable it is equal to based on the units.

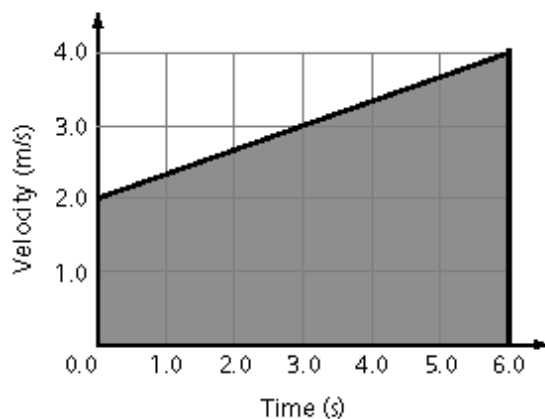
1.



2.



3.



4.

