Discovery Exercise: Adding Up the Pieces

1. An object travels with velocity $v = 4$ miles/hour from 2:00 until 8:00. How far does the object travel?

2. Another object travels with velocity:

$$v(t) = \begin{cases} 4 \text{ mph} & 2 \leq t < 4 \\ 8 \text{ mph} & 4 \leq t < 6 \\ 16 \text{ mph} & 6 \leq t \leq 8 \end{cases}$$

   (All times are measured in hours.) How far does the object travel between $t = 2$ and $t = 8$?

   See Check Yourself #26 at felderbooks.com/checkyourself

3. A thin metal bar has a linear density given by $\lambda = 4$ kg/m. How much mass lies within a 6-meter length of this bar?

4. Another bar has a linear density given by:

$$\lambda(x) = \begin{cases} 4 \text{ kg/m} & 2 \leq x < 4 \\ 8 \text{ kg/m} & 4 \leq x < 6 \\ 16 \text{ kg/m} & 6 \leq x \leq 8 \end{cases}$$

   (All distances are measured in meters.) What is the mass of the part of the object that lies between $x = 2$ and $x = 8$?