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$i)$ Suppose that water is **leaking out of a tank** at a rate given by the function:

$$b(t) = 2t$$

where t has units hours, and $b(t)$ has units meters cubed per hour. How much water has leaked out of the tank after 4 hours?

$ii)$ You are running errands, and your velocity, with respects to your house, is given in miles per an hour as a function of t hours after your left your house by:

$$v(t) = \begin{cases} 2 & \text{for } 0 \le t \le 2 \\ 0 & \text{for } 2 \le t \le 3 \\ -2t & \text{for } 3 \le t \le 4 \end{cases}$$

Find how far away you from at $t = 5/2$ hours, and $t = 4$ hours. Find the total distance traveled.

$iii)$ The rate at which the volume in a tank of water is changing is given by the function:

$$f(t) \begin{cases} \sqrt{(t-3)^2 - 9} \text{ for } 0 \le t \le 3 \\ 2t - 9 \text{ for } t \ge 3 \end{cases}$$

where t has units hours, and f has units cubic meters per hour. If the initial volume of the tank is 30 cubic meters, find the total volume of the tank after $t = 5$ hours (**hint:** how would the answers to $ii)$ change if we still measured distance from the house, but you started 3 miles in the positive direction away from your house?). Find the total change in the volume after $t = 6$ hours (i.e. we don't care whether water leaked out, or was pumped in we, we want to keep track of all of it equally).

$iv)$ You are camping, and the sun has set. At midnight, the temperature in your tent is 55 degrees Fahrenheit, the rate at which the temperature in your tent is changing is given by the function:

$$T(t) = \begin{cases} -2 & \text{for } 0 \le t \le 6 \\ 4(t-6) - 2 & \text{for } 6 \le t \le 7 \\ 2 & \text{for } 7 \le t \end{cases}$$

where $T(t)$ has units degree Fahrenheit per hour, and t has units hours after midnight. Find the temperature in your tent at 10am. Find the total change in temperature at 10am (i.e. we don't care whether the temperature increased or decreased, we want to keep track of all it equally).