Notes: Net or Total Change Integration Day 8

$\int velocity\, \frac{miles}{hour} =$_____ $\int \frac{dollars}{chips} =$_____

$\int acceleration\, \frac{meters}{second^2} =$_____ $\int \frac{gallons}{minute} =$_____ $\int \frac{cars}{hour} =$_____

Example 1: At 7am, water begins leaking from a tank at a rate of $leaking = 2t + .25t$ gallons per hour (t is the number of hours after $7am$). How much water is lost between $9am$ and $11\ am$?

Example 2: The number of cars per hour passing an observation point along a highway is called the rate of traffic flow $q(t)$ in cars per hour.

A. What is $\int_{t_1}^{t_2} q(t)\ \mathrm{dt}$=

B. The flow rate is recorded at 15-$minute$ intervals between $7{:}00am$ and $9{:}00am$. Estimate the number of cars using the highway during this $2-hour$ period by taking the average of the left and right endpoint approximations.

t	7:00	7:15	7:30	7:45	8:00	8:15	8:30	8:45	9:00
$q(t)$	1,044	1,297	1,478	1,844	1,451	1,378	1,155	802	542

Displacement VS Distance

<u>Displacement vs Total Distance:</u>

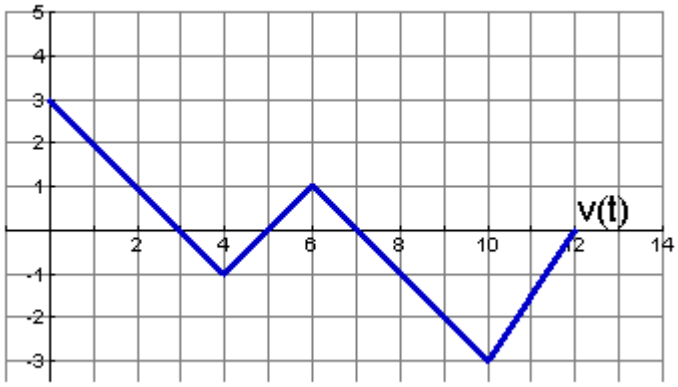
Displacement: How far from home (includes pos/neg) from where you started.

$$Displacement = \int_{t_1}^{t_2} v(t)dt = \int_{t_1}^{t_2} \frac{measure\ of\ length}{measure\ of\ time} dt = measure\ of\ length$$

Total Distance: How far you have traveled.

$$Total\ Distance = \int_{t_1}^{t_2} |v(t)|dt = \int_{t_1}^{t_2} \left|\frac{measure\ of\ length}{measure\ of\ time}\right| dt = measure\ of\ length$$

Example 3: $v(t)$ is the velocity function of your distance from Hillgrove High School.



A. How far are you from the the Grove after 3 $mins$.

B. How far have you traveled after 3 $mins$.

C. How far are you from the the Grove after 5 $mins$.

D. How far have you traveled after 5 $mins$.

E. How far are you from the the Grove after 13 $mins$.

F. How far have you traveled after 13 $mins$.

Example 4: Assume a particle moves along a straight line with given velocity. Find the total displacement and total distance over the time interval.

A. $f(x) = x^2 - 2x - 4 \ \ [-5,5]$

B. $v(x) = x^2 - x - 6 \ \ [-10,10]$