$\int$ Rate

$\int$ Rate = Amount

$\int \frac{\text{miles}}{\text{hour}}$

$\int \text{accelleration} = \int \frac{\text{miles}}{\text{hours}^2}$

$\int \frac{\text{gallons}}{\text{min}}$

$\int \frac{\text{miles}}{\text{hour}}$ = amount of miles

$\int \text{acceleration} = \int \frac{\text{miles}}{\text{hours}^2} = \text{velocity}$ $\boxed{\text{OR}}$ $\frac{\text{miles}}{\text{hour}}$

$\int \frac{\text{gallons}}{\text{min}}$ = amount of gallons

When a certain grocery store opens, it has 50 pounds of bananas on a display table. Customers remove bananas from the display table at a rate modeled by

$$f(t) = 10 + (0.8t)sin\left(\frac{t^3}{100}\right) \quad for \quad 0 \le t \le 12,$$

where $f(t)$ is measured in pounds per hour and t is the number of hours after the store opened. How many pounds of bananas are removed from the display table during the first 2 hours the store is open?

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$f(t) = $ Rate bananas are Removed in $\frac{\text{pounds}}{\text{hour}}$

$$\int_0^2 f(t)\ \frac{\text{pounds}}{\text{hour}} = \int_0^2 10 + .8t \cdot \sin\left(\frac{t^3}{100}\right) dt$$

= 20 pounds of bananas are removed

How do you calculate displacement & distance? What is the difference in the 2?

displacement: How far you are from where you start

$\int v(t)dt$ ■ Travel from home to school (10 miles) & back home (-10 miles), then displacement = 0.

distance: total distance traveled

$\int |v(t)|dt$ ■ Travel from home to school (10 miles) & back home (|-10 miles|) then distance = 20 miles.

$v(t) = 4x - 2$

Find displacement traveled & total distance traveled from [0, 2]

$\text{displacement} = \int_0^2 4x - 2\,dx$

$= \frac{4x^2}{2} - 2x\Big|_0^2 = 2x^2 - 2x\Big|_0^2 = 2(4) - 2(2) - 0 + 0 = \boxed{4}$

$4x - 2 = 0$

$x = \frac{1}{2}$

0 − ½ + 2

$4(\frac{1}{4}) - 2$ = neg

$4(1) - 2$ = pos

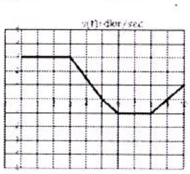
$\text{distance} = \int_0^2 |4x - 2|dx$

$= -\int_0^{1/2} 4x - 2\,dx + \int_{1/2}^2 4x - 2\,dx$

$= -\left(2x^2 - 2x\Big|_0^{1/2}\right) + \left(2x^2 - 2x\Big|_{1/2}^2\right)$

$-\left(-\frac{1}{2}\right) + \left(\frac{9}{2}\right)$

$= \boxed{5}$



Find displacement from [0,5].

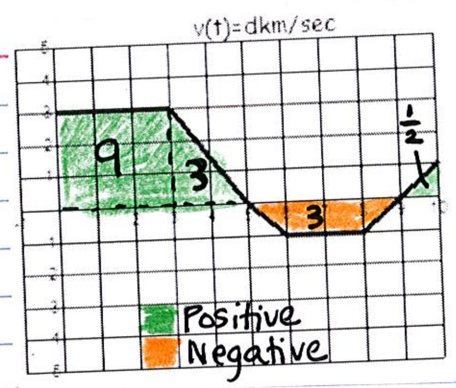
Find distance from [0,5].

Find displacement from [0,9].

Find distance from [0,9].

Find displacement from [0,10].

Find distance from [0,10].



Find displacement from [0,5].
= 12

Find distance from [0,5].
= 12

Find displacement from [0,9].
= 12 − 3 = 9

Find distance from [0,9].
= 12 + |−3| = 15

Find displacement from [0,10].
= 12 − 3 + .5 = 9.5

Find distance from [0,10].

= 12 + |−3| + .5 = 15.5