Interpreting Integrals

Note Title 09/05/2012

Eg#1 Suppose that $C(t)$ represents the cost per day of heating your home. t is the number of days since Jan 1, 2012. [$t=0$ the beginning of the day Jan 1; $t=1$ represents the beginning of Jan 2nd etc).

$\int_0^{90} C(t)\,dt = \$590$ Cost of heating for 1st 90 days was \$590.

$\frac{1}{90}\int_0^{90} C(t)\,dt = \$6.56$ Average cost (per day) of heating over first 90 days of 2012.

Eg#2 The rate at which the world's oil supply is being consumed is continually increasing. $r(t) = 32e^{0.05t}$ where $r(t)$ is in billions of barrels per year and $t=0$ represents the beginning of 2005.

Write an integral that represents:

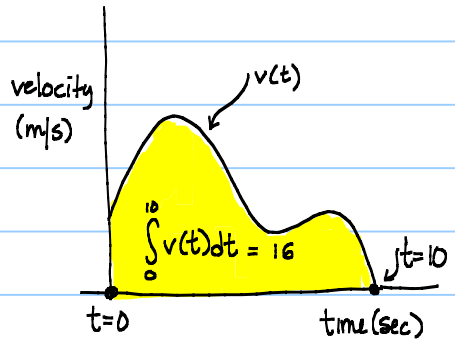
a) the amount of oil consumed from 2005 to 2015.

$\int_0^{10} 32e^{0.05t}\,dt = 415.2$ billion barrels

b) the average amount of oil consumed per year from 2010 to 2015.

$\frac{1}{5}\left[\int_5^{10} 32e^{0.05t}\,dt\right] = 46.7$ billion barrels/year

Eg#3



Represents a person out for a walk

$$\int_0^{10} v(t)dt = 16$$

means after 10 seconds I am 16 m from where I was at t=0 seconds.

If I was 2 m to the left of an oak tree at t=0 sec then to find my position at t=10 sec

$$-2 + \int_0^{10} v(t)dt = -2 + 16 = 14$$

∴ 14 m to right of oak tree.

Worksheet ANSWERS

1) foot pounds
2) m/s
3) dollars
4) $\int_0^{60} f(t)dt$
5) The difference in the mass change of these two stars in the 1st century of growth.
6) $\int_0^{5} 10e^{0.2t}\,dt \doteq 85.9$ gallons
7) $5 + \int_0^{1} v(t)dt = 5 + 8\frac{1}{3} = 13\frac{1}{3}$ km

(assuming velocities in km/h)