Reminders 07-08-09:

- Buy Textbook and Read Chapters 1-3
- www.hotmath.com
- Thursday I Will Answer Homework Questions
- Sign Last Page of Syllabus No Later than Thur.

Log into Webassign

- Purchase "AMPAD" paper
- Need Scientific Calculator for Exams
- Significant Figures Handout
- 1st Webassign due Thursday 11:59PM
- Answers to Standardized Test p.29 C,C,B,A,A; 6a is F/m;6b is 0.001; 6c is F/(.001m)=2.7/(0.001*350).
- Note- some of the textbook problems have answers;please use them for practice.

Objectives:

- Physical Modeling
- Problem Solving
- One Dimensional Motion

A unit of distance used in Astronomy is called the light-year, which is equivalent to the distance a beam of light travels in a year. Astronomers use this unit because of the large distances between celestial bodies. The distance in which light travels (in free space) in one second is 2.99792458×10^8 m.

- **How many meters are there in one light-year (quote the value to 4 decimal places)**

$$\left(2.99792458 \times 10^8 \frac{m}{s}\right)\left(\frac{60\,s}{m}\right)\left(\frac{60\,m}{hr}\right)\left(\frac{24\,h}{d}\right)\left(\frac{365\,d}{yr}\right)$$

$$= 9.4542 \times 10^{15}\,m$$

$$1 \text{ light-yr} = 9.4542 \times 10^{15}\,m$$

$V_{EARTH} = \frac{4}{3}\pi R^3$ Assume all of Earth is oil

$R = 6.37 \times 10^6 m$

$V = \frac{4}{3}\pi (6.37 \times 10^6 m)^3 = 1.10 \times 10^{21} m^3$

$(1.10 \times 10^{21} m^3)\left(\frac{1000 L}{m^3}\right)\left(\frac{1 gal}{3.785 L}\right)\left(\frac{1 b}{42 gal}\right)$

$= 6.90 \times 10^{21}$ barrels

We use $80 \times 10^6 \frac{barrels}{day}$

days it lasts is

$$\frac{6.90 \times 10^{21} \text{ barrels}}{80 \times 10^6 \text{ barrels/day}}$$

8.63×10^{13} days

Convert to years

$(8.63 \times 10^{13} days)\left(\frac{1 yr}{365.25 days}\right)$

2.36×10^{11} yrs

Assume 5% growth in consumption

Use 70 rule

barrels/yr

$\left(80 \times 10^6 \frac{b}{d}\right)(365.25) = 2.92 \times 10^{10} \frac{b}{y}$

How do I double $2.92 \times 10^{10} \frac{b}{y}$ to reach 6.9×10^{21} b

$(2^x) \cdot 2.92 \times 10^{10} = 6.9 \times 10^{21}$

$2^x = \frac{6.9 \times 10^{21}}{2.92 \times 10^{10}} = 2.36 \times 10^{11}$

Oil consumption has to double about 38 times.

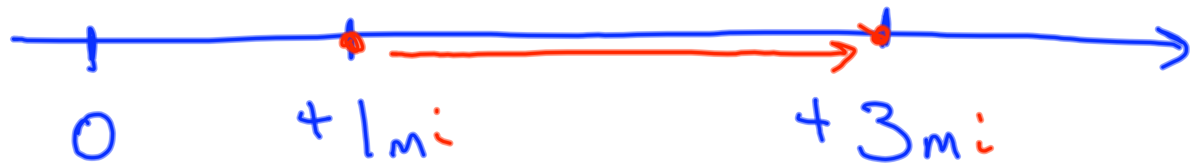
$$38 \cdot 14 = 532$$

Round off to 500yrs

$$V = \frac{4}{3}\pi\left(R_{OUTER}^3 - R_{Inner}^3\right)$$

physics.sierracollege.edu/people/dcalabrese/calabrese.html

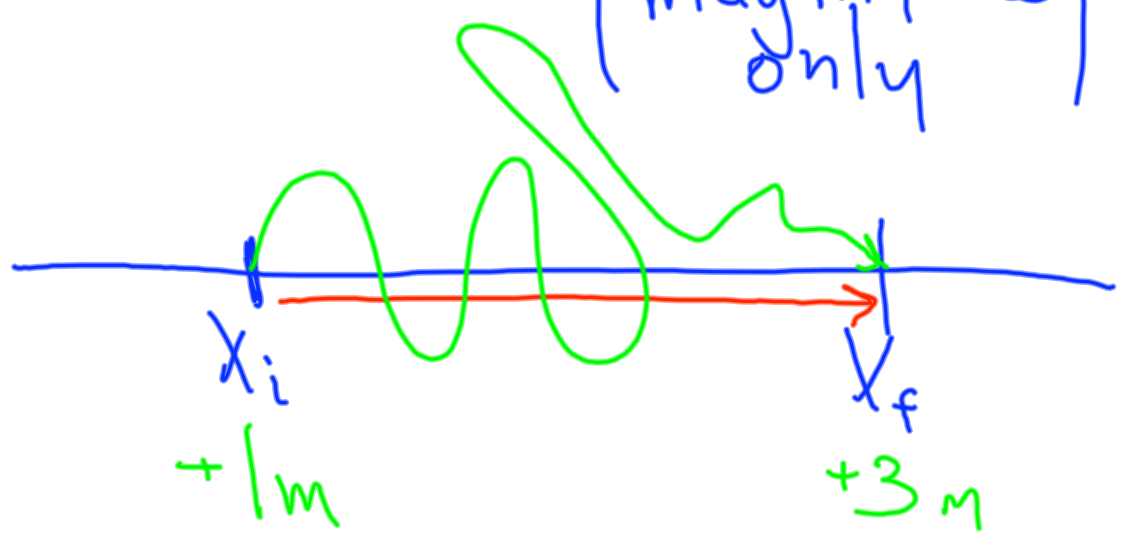
1st exam scheduled Tuesday 7/14



$\Delta \vec{x} = +3m - +1m = +2m$ right

displacement ⇒ vector
(magnitude & direction)

mass ⇒ scalar
(magnitude only)



Kinematics in One Dimension

- **Definitions (continued)**
  - **Average Velocity**-*Displacement* divided by elapsed time. The unit is m/s.

$$\vec{v} = \frac{\Delta\vec{s}}{t_f - t_i} = \frac{\Delta\vec{s}}{\Delta t}$$

  - **Average Speed**-Total *distance* traveled divided by elapsed time. It <u>is not</u> the magnitude of average velocity.

- An airplane changes its position by 4250 km toward the east in 5.0 hours.
  - What is the airplane's displacement?
  - What is its total distance traveled?
  - What is the average velocity of the airplane?
  - What is the average speed of the airplane?
  - How far have you traveled after 2.0hrs?

displacement is 4250Km east

total distance traveled is at least 4250Km

$$\vec{V}_{avg} = \frac{\Delta \vec{X}}{\Delta t} = \frac{4250\text{Km}}{5\text{hr}} = 850\frac{\text{Km}}{\text{hr}} \text{ east}$$

average speed is at least $850\frac{\text{Km}}{\text{hr}}$

solve for $\Delta \vec{X}$

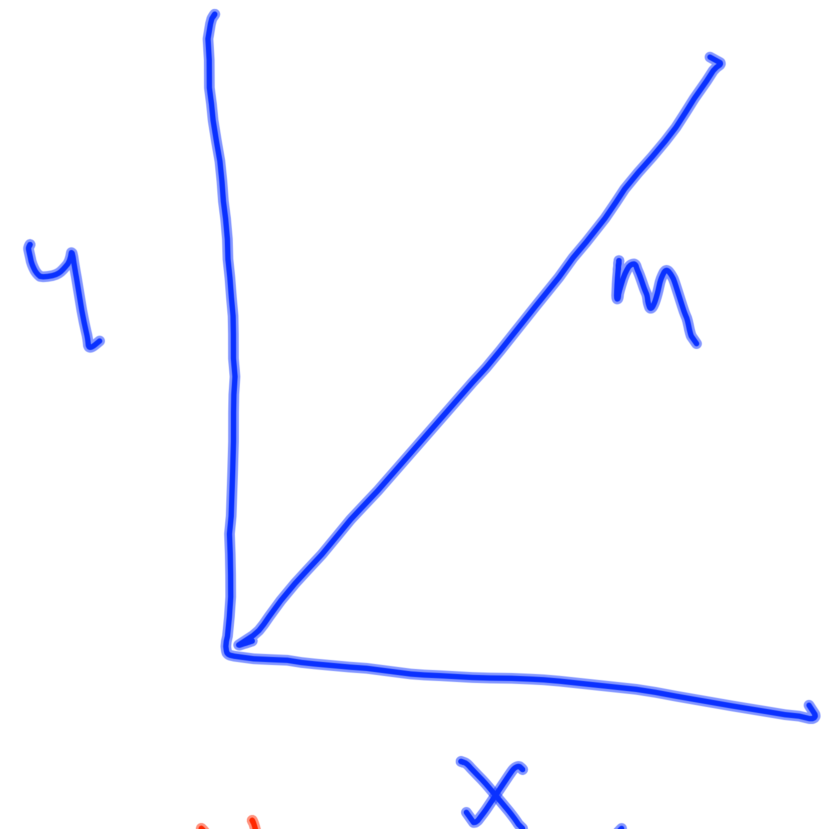
$$\Delta \vec{X} = \vec{V}_{avg} \Delta t = \left(850\frac{\text{Km}}{\text{hr}}\right)(2\text{hr})$$

1700Km

magnitude of $\Delta \vec{X} = |\Delta \vec{X}|$

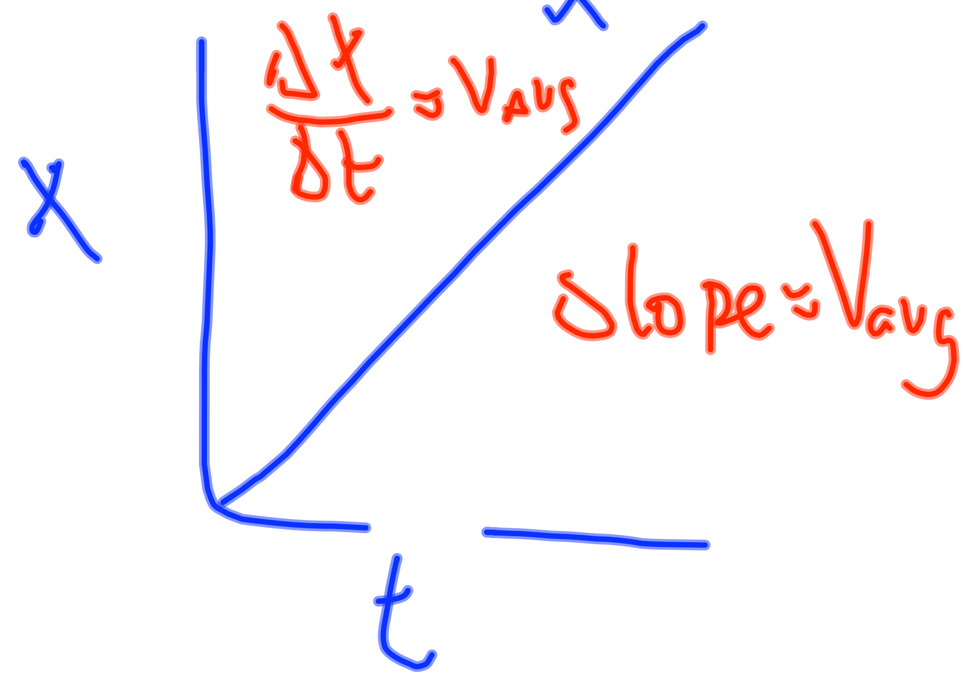
directly proportional

$$y = m x$$



$$\vec{v}_{avg} = \frac{\Delta \vec{x}}{\Delta t}$$

$$\Delta \vec{x} = \vec{v}_{avg} \, \Delta t$$



Kinematics in One Dimension

– **Instantaneous Velocity**-tells you how fast and in what direction an object is traveling at any instant in time. This means that we must apply the average velocity equation in a time interval becomes infinitesimally small.

$$\vec{v} = \frac{\Delta \vec{x}}{\Delta t} \qquad \lim_{\Delta t \to 0}$$