

Physics 113 - September 7, 2006

Class issues:

- Final Exam Time → error in syllabus

Monday, Dec. 18, 2006 7:15pm

- Email list serv → Pass around Sheets
- Workshop Signups
- Laboratory/statistics lecture time
- PRS device ... which type

Is this right?

use common sense

Estimate

dimensional Analysis

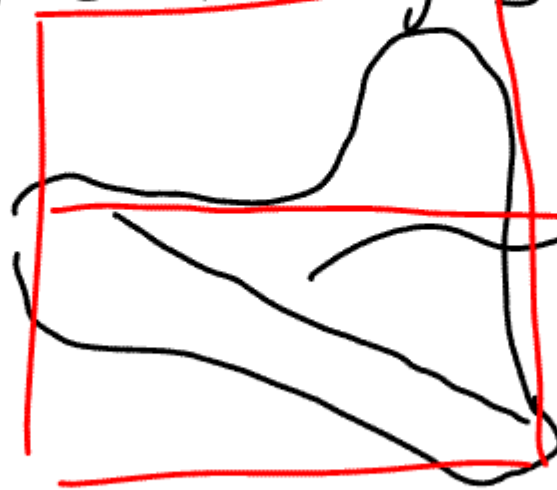
limiting cases

Think about your equations
And Answers . . .
Plug-n-chuggers
beware

How many birds are in NY STATE?

10 birds per football field

100 yds x 50 yds



6 hrs
at
60 mph

→ 360 mi

$$\left(\frac{1}{2}\right) 360^2 \text{ mi}^2 = 64800 \text{ mi}^2$$

$$\text{True} \rightarrow 49,576 \text{ mi}^2$$

yard \rightarrow Mile

$$1 \text{ yard} \times \frac{3 \text{ ft}}{1 \text{ yard}} \times \frac{1 \text{ Mi}}{5280 \text{ feet}} = .0006 \text{ Mi}$$

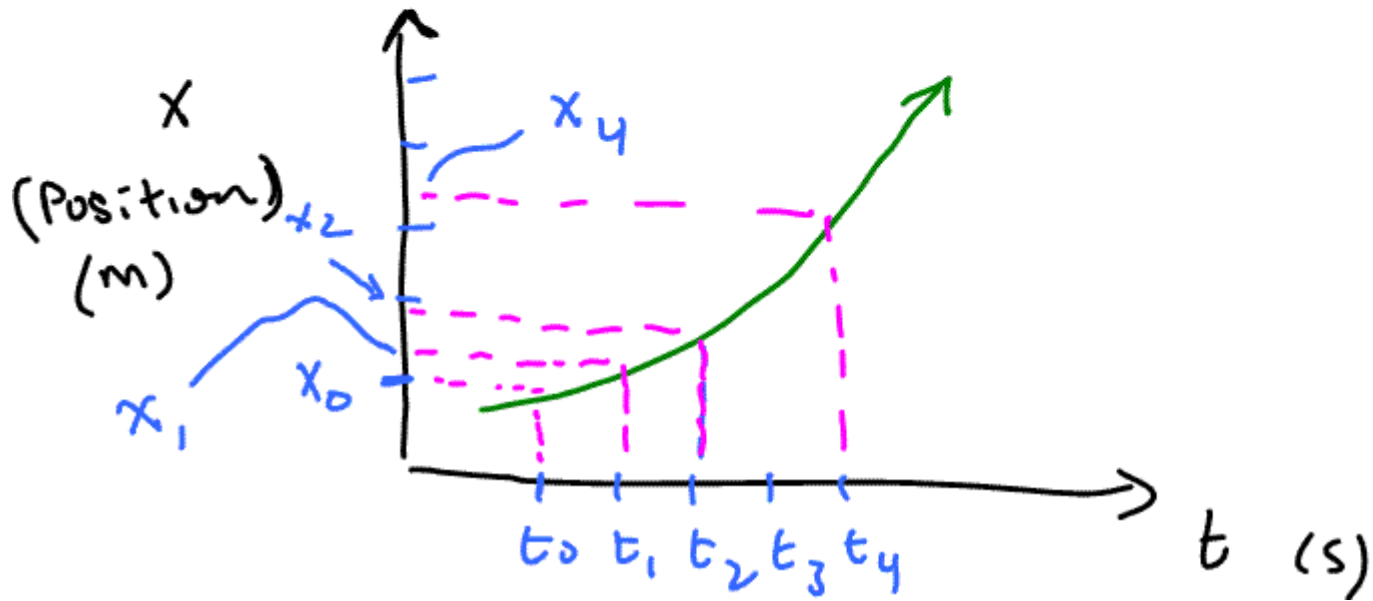
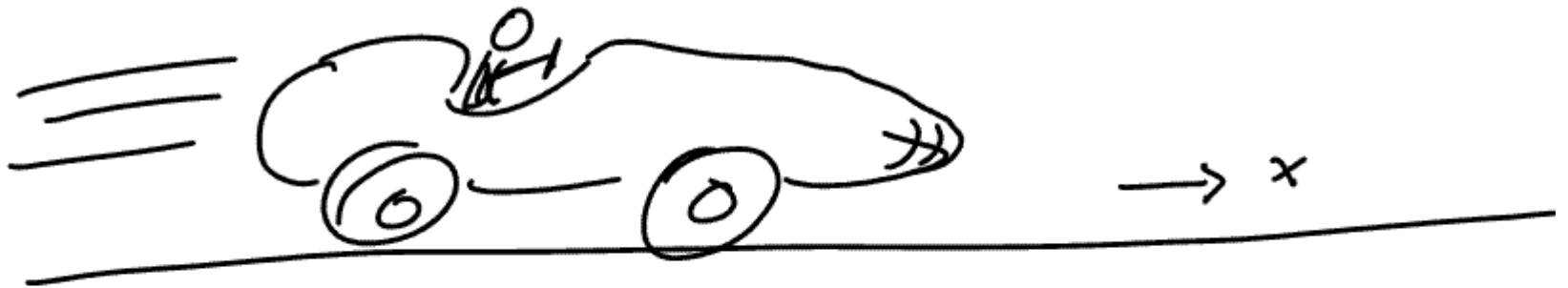
Football field 100 yd \times 50 yd

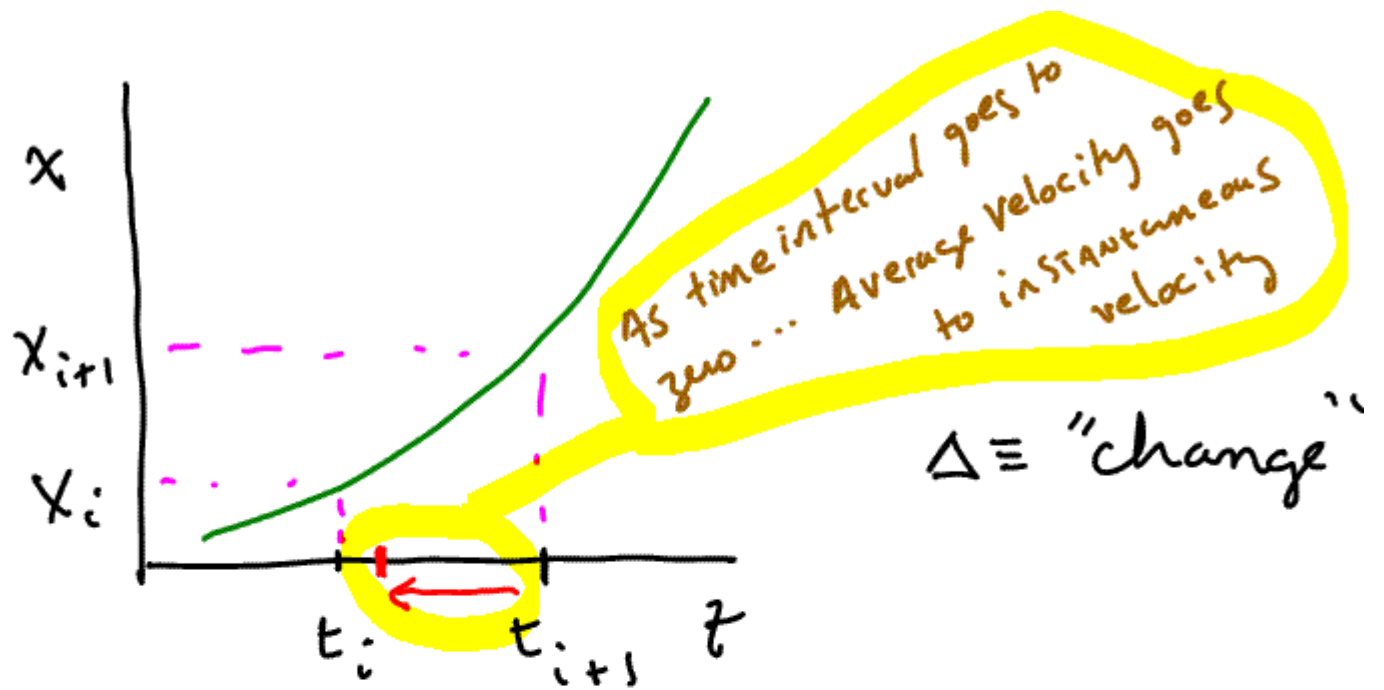
$$\hookrightarrow .0016 \text{ mi}^2$$

$$\frac{10 \text{ birds}}{.0016 \text{ mi}^2} = \frac{X \text{ birds}}{64800 \text{ mi}^2}$$

405 million birds

1 d Kinematics





$$\text{Ave speed over interval} = \frac{x_{i+1} - x_i}{t_{i+1} - t_i} = \frac{\Delta x}{\Delta t}$$

Speed has Magnitude only

$$\text{units} \equiv \frac{\text{Position}}{\text{time}} = \frac{\text{m}}{\text{s}}$$

$V \equiv$ Ave Velocity \equiv Ave Speed w/ direction taken into Account



$$\frac{\Delta x}{\Delta t} \quad \frac{m}{s} \quad \text{in the } +x \text{ direction}$$

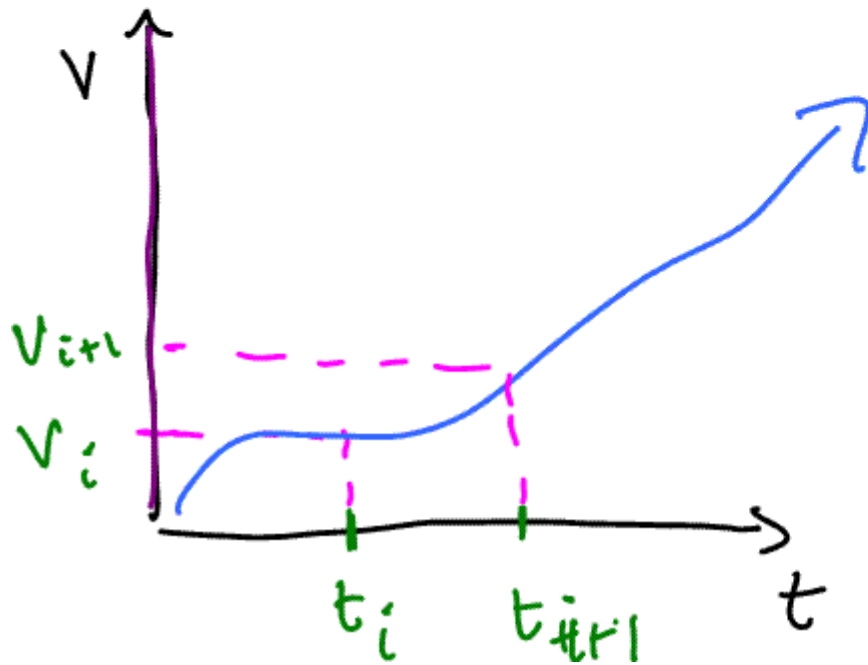
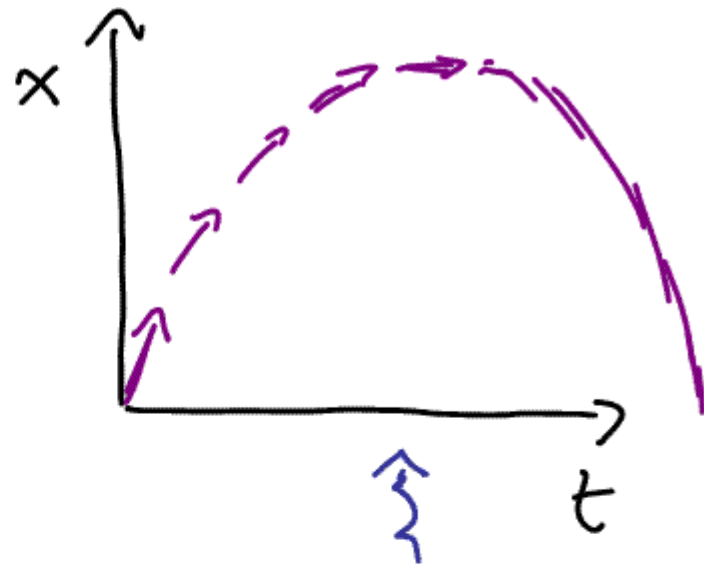
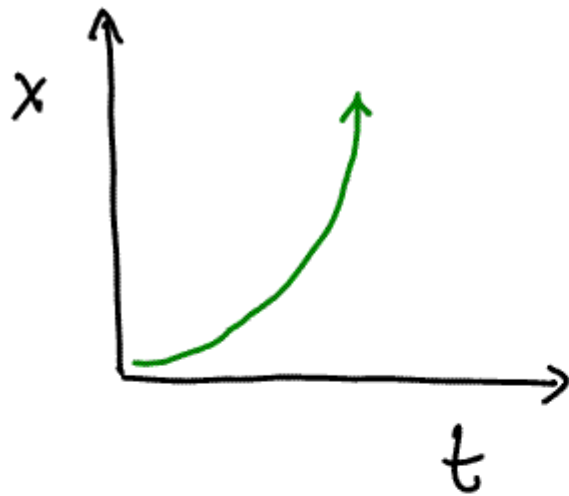
has
magnitude
+
direction

1d motion
direction is given by
a sign

$$V_{\text{at time } t} = \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$$

(start of Δt interval) "+" or "-" "INSTANTANEOUS" velocity

slope of x-t graph



$x-t$ graph for ball
tossed straight
up in air

$$\frac{\Delta v}{\Delta t} = \frac{v_{i+1} - v_i}{t_{i+1} - t_i} \equiv \text{Average Acceleration}$$

$$\frac{\frac{m}{s}}{s} \equiv \frac{m}{s^2}$$

INSTANTANEOUS Acceleration

$$\lim_{\Delta t \rightarrow 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt}$$

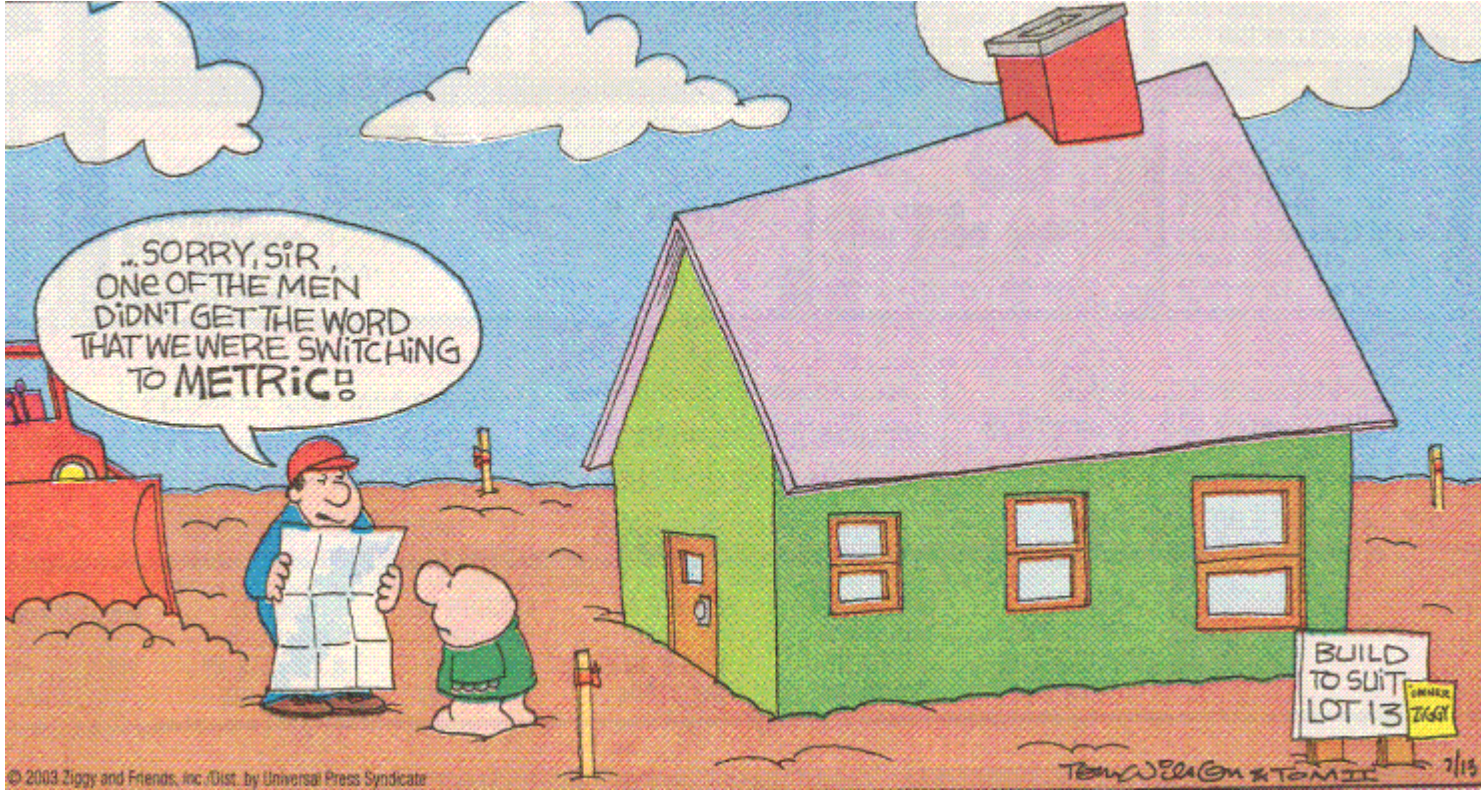
has
direction

accel is slope of v-t
graph

Kinematic Variables

	<u>MKS</u>	<u>CGS</u>	<u>English</u>
x position	m	cm	feet
v velocity	m/s	cm/s	feet/s
a acceleration	m/s ²	cm/s ²	feet/s ²
t time	s	s	s

units are
important!



Two Teams, Two Measures Equaled One Lost Spacecraft

By ANDREW POLLACK

LOS ANGELES, Sept. 30 — Simple confusion over whether measurements were metric or not led to the loss of a \$125 million spacecraft last week as it approached Mars, the National Aeronautics and Space Administration said today.

An internal review team at NASA's Jet Propulsion Laboratory said in a preliminary conclusion that engineers at Lockheed Martin Corporation, which had built the spacecraft, specified certain measurements about the spacecraft's thrust in pounds, an English unit, but that NASA scientists thought the information was in the metric measurement of newtons.

The resulting miscalculation, undetected for months as the craft was designed, built and launched, meant the craft, the Mars Climate Orbiter, was off course by about 60 miles as it approached Mars.

"This is going to be the cautionary tale that is going to be embedded into introductions to the metric system in elementary school and high school

and college physics till the end of time," said John Pike, director of space policy at the Federation of American Scientists in Washington.

Lockheed's reaction was equally blunt.

"The reaction is disbelief," said Noel Hinners, vice president for flight systems at Lockheed Martin Astronautics in Denver, Colo. "It can't be something that simple that could cause this to happen."

The finding was a major embarrassment for NASA, which said it was investigating how such a basic error could have gone through a mission's checks and balances.

"The real issue is not that the data was wrong," said Edward C. Stone, the director of the Jet Propulsion Laboratory in Pasadena, Calif., which was in charge of the mission. "The real issue is that our process

Continued on Page A16

ON MICHAEL FERRELL'S 11th, CONGRATS, THE
1st of many appearances on this page! — ADVT.



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