Physics 101

Lecture 1. Monday, Jan. 5, 2004

Topics: 1. Course Introduction

2. 1-D Kinematics

Ref: Walker. ch. 2.

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1. Course Introduction

- Instructor: Dr. Michael CHEN

  http://www.sfu.ca/~mxchen/

  click on "physics 101" for the course webpage

- Textbook: Physics by James S. Walker

  1st. OR. 2nd Edition.

- Exam Dates: Midterm #1: Friday Feb. 13, 2004

  Midterm #2: Friday March 12, 2004

  Final Exam: Thur. April 8, 2004

  12:00 - 3:00 PM.

- Grading : The best of ①. ②. ③. ④

① . Assignments : 10% . (CAPA + hand written)
Midterms : 40% (2 x 20%)
Final exam: 50% .

② . Assignments : 10%
Midterm : 20% . (The best of midterm #1 and #2)
Final exam: 70% .

③ . Assignments : 10%
Final exam: 90% .

④ . Final exam : 100%

- Assignments : CAPA — Computer-Assisted Personalized Assignments
(See the course webpage) .
Hand written assignments :
How and where to turn in.
(Movie)

- Open Labs : · Tutorial .
(NOT mandatory) .
M. T. 12:30 - 17:20. P8445 B .

- Exams: No cheating !
  closed book.
  A one-page handwritten formula sheet is allowed.

- Main Topics in this course (phys101):

  Mechanics
  waves
  Thermal physics.

- Mechanics
  — The study of Motion

  ① Kinematics — Description of Motion

  ② Dynamics — cause of Motion
  (Relation between motion and forces)

1-D Kinematics

– Description of Motion along a straight line.

e.g. A man running along a straight line.

- Set up a coordinate system whenever you try to describe the motion of an object.

- position : x — at a given time t · the object is at x.

  e.g: at time t_1, the man is at x_1
  " " t_2, " " " x_2.

- Displacement — change in position.

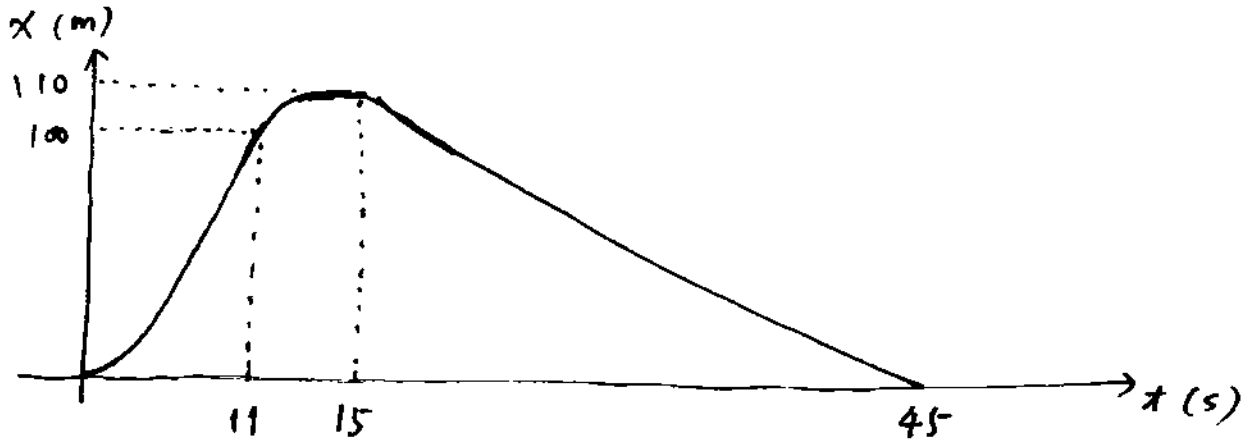
$$\Delta x = x_2 - x_1 = x_{final} - x_{initial}.$$

- Distance — length of travel.

$d \geq 0$. always.

e.g: A round trip of an 100-m runner.

x-t graph.



$\begin{cases} t_1 = 0 \\ x_1 = 0 \end{cases}$ $\begin{cases} t_2 = 45 \\ x_2 = 0 \end{cases}$.

time interval
$\Delta t = t_2 - t_1$
$= 45\ s$.

Displacement : $\Delta x = x_2 - x_1 = 0$.

Distance : $d = 220\ m$.

- Average speed : $s_{av} = \frac{d}{\Delta t} = \frac{220\ m}{45\ s} = 4.89\ m/s$.

- Average velocity : $v_{av} = \frac{\Delta x}{\Delta t} = \frac{0}{45\ s} = 0$.

Note : $\begin{cases} \Delta x \text{ can be } +, -, \text{ OR } 0. \\ \text{so can } v_{av}. \end{cases}$

but, d and s_{av} cannot be negative!

- Does the average velocity represent how fast the man is running ?

  — Not always .

  — Neither the average speed .

- e.g: A photo-Radar generated Speeding Ticket .

  $v = 72$ km/h .

  Speed limit $= 60$ km/h .

  On that day in 1996 : distance $= 10$ km

  elapsed time $= 15$ min $= 0.25$ h .

  average speed $= \frac{10\text{ km}}{0.25\text{ h}} = 40$ km/h .

However, what the photo radar measured was the <u>instantaneous velocity</u> — How fast at that instant when the picture was taken .

$$v \equiv \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} . \quad \left(\equiv \frac{dx}{dt} \right)$$

When Δt is small, $v \approx v_{av}$.

When v is constant, $v = v_{av}$.

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