Ch 2.1-2.2: Velocity

PHYS 1210 Prof. Jang-Condell

Which is the best way to address the PHYS 1210 professor?

A. Hey Hannah

B. Yo Prof

C. Ms. Jang

D. Prof. Jang-Condell

E. Dr. Condell

Course website

http://tinyurl.com/phys1210jc

- Course syllabus
- Lecture notes
- Helpful links
- and more!

Vectors Recap

Example Problem

You are working for the summer on the Wyoming Search and Rescue squad when you get a call of a downed aircraft. The plane took off from Cheyenne at 12:15, flew north 100 miles, and then 80 miles in a direction 30 degrees north of west, where it vanished from radar at 1:05.

a) What was the average speed of the plane?

b) What was the average velocity of the plane?

c) In which direction and how far from Cheyenne should your team fly?

Units

Standards and units

- Length, time, and mass are three *fundamental* quantities of physics.
- The *International System* (SI for *Système International*) is the most widely used system of units.
- In SI units, length is measured in *meters*, time in *seconds*, and mass in *kilograms*.

Sample Problem

- A car driving along at 50 mph. How fast is this is m/s?

Sample Problem

- Your physics instructor is pacing in front of the classroom at 1 m/s. How fast is this in miles per hour?

Goals for Chapter 2

- To describe straight-line motion in terms of velocity and acceleration
- To distinguish between average and instantaneous velocity and average and instantaneous acceleration
- To interpret graphs of position versus time, velocity versus time, and acceleration versus time for straight-line motion
- To understand straight-line motion with constant acceleration
- To examine freely falling bodies
- To analyze straight-line motion when the acceleration is not constant

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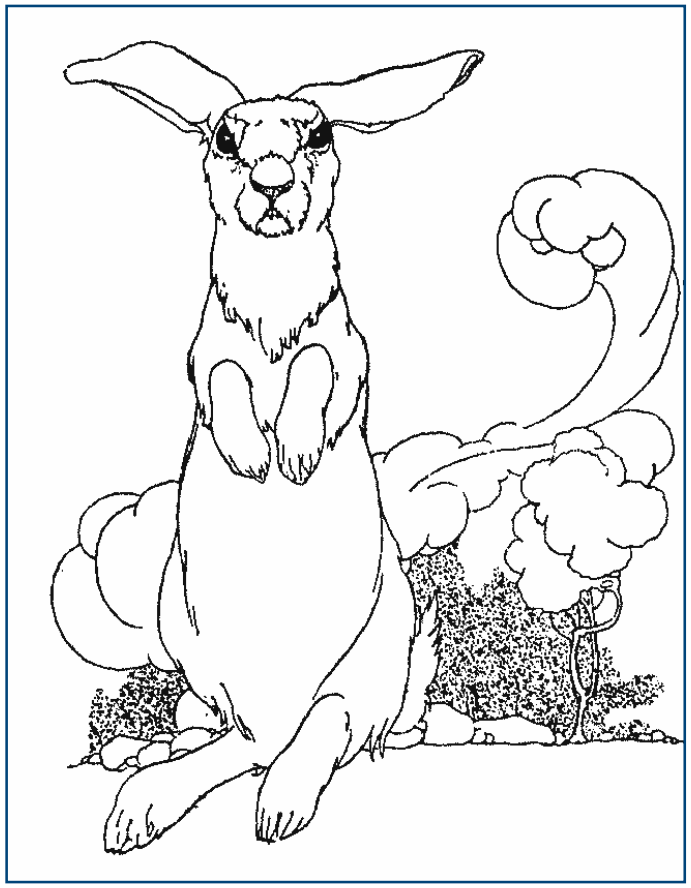
The Tortoise and the Hare

Told in words, formulae, and graphs




FIN

There once was a speedy hare who bragged about how fast she could run. Tired of hearing her boast, a tortoise challenged her to a race. All the animals in the forest gathered to watch.

Hare ran down the road for a while and then and paused to rest. She looked back and saw Tortoise far behind her. So, Hare stretched herself out alongside the road and fell asleep, thinking, "There is plenty of time to relax."

Tortoise walked and walked. She kept on steadily until she came to the finish line.

The animals who were watching cheered so loudly for Tortoise, they woke up Hare.

Hare stretched and yawned and began to run again, but it was too late. Tortoise had won the race.

Who was fastest?

F. The tortoise.

G. The hare.

H. They had the same speed.

I. What do you mean by faster?

Exercise

- Describe the Tortoise-and-Hare race using a position-time graph.

Who had the fastest average speed?

K. The tortoise.

L. The hare.

M. Their average speeds were the same.

N. Over what time interval?

Who had the fastest maximum instantaneous speed?

Q. The tortoise.

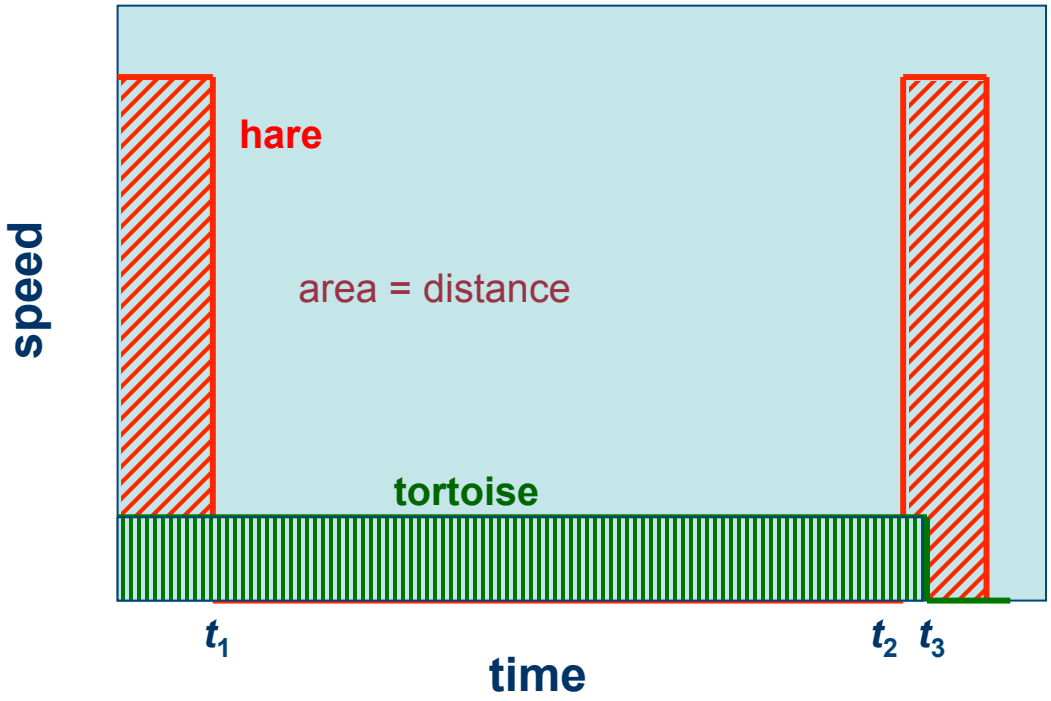
R. The hare.

S. Their instantaneous speeds were the same.

Exercise

- Describe the Tortoise-and-Hare race using a velocity-time graph.

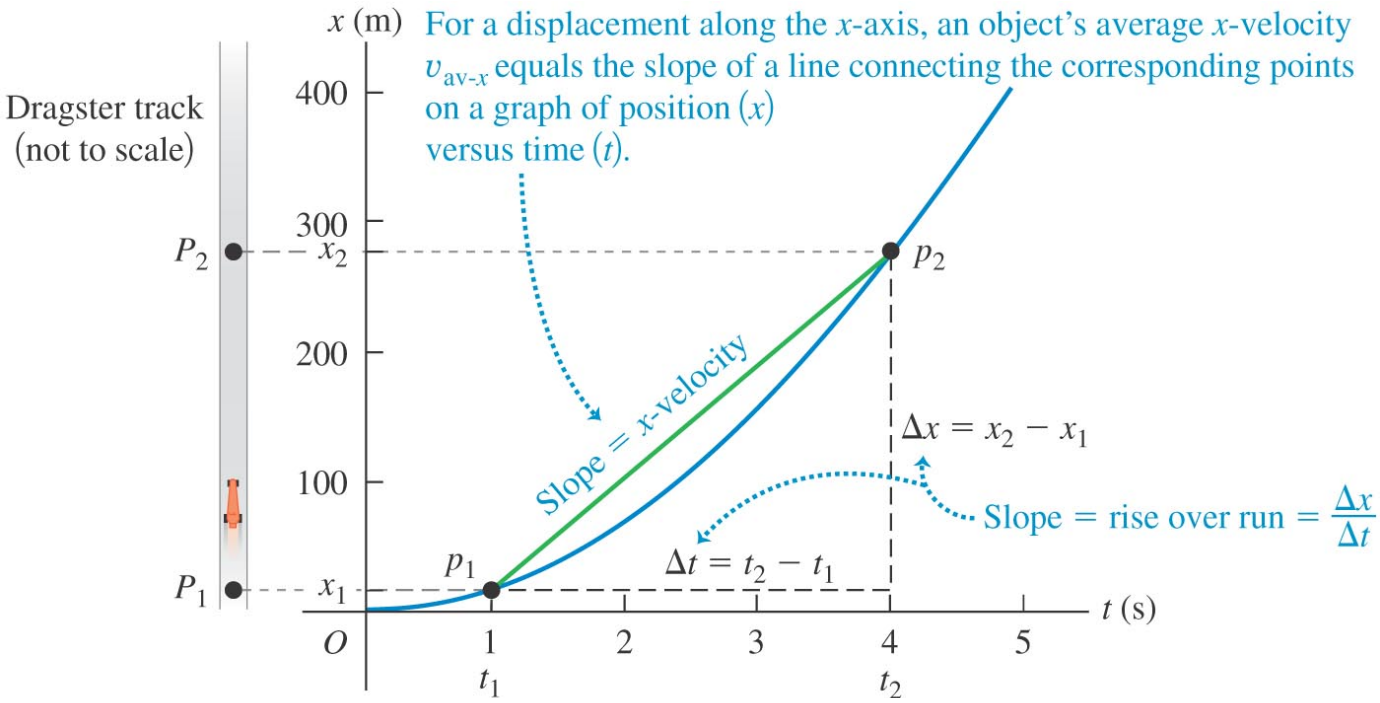
Speed and Areas



Average and Instantaneous Velocity

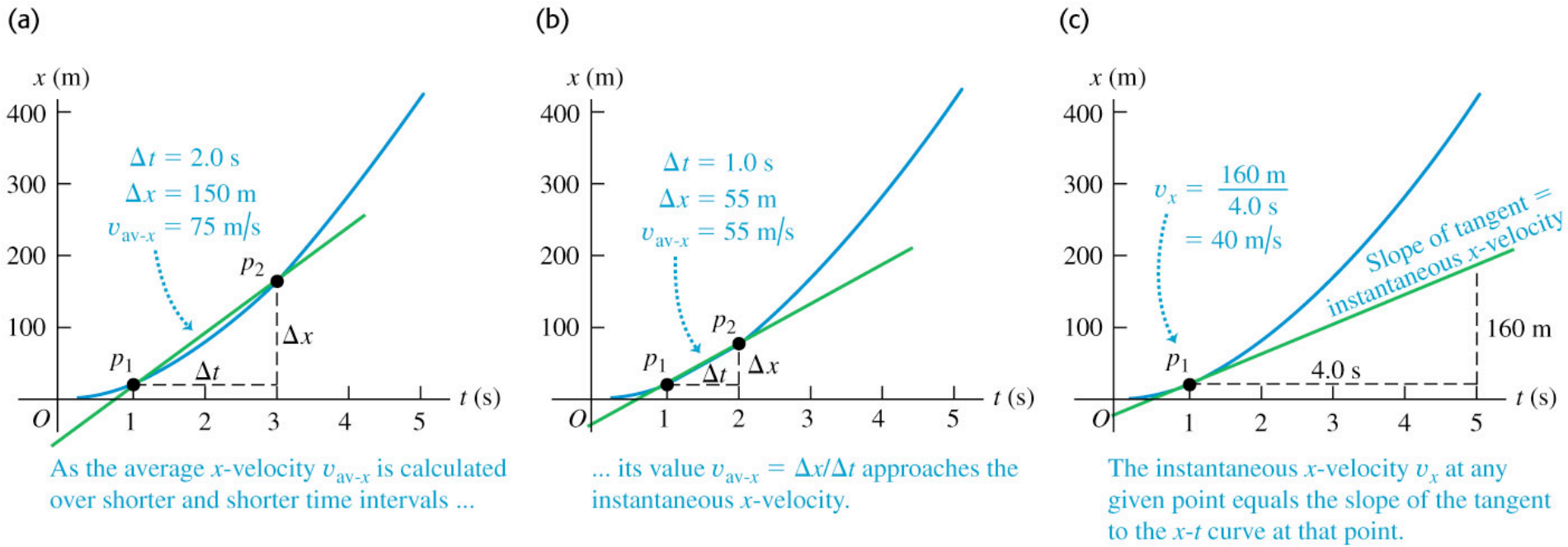
A position-time graph—Figure 2.3

- A position-time graph (an *x*-*t* graph) shows the particle's position *x* as a function of time *t*.
- Figure 2.3 shows how the average *x*-velocity is related to the slope of an *x*-*t* graph.



Finding velocity on an *x-t* graph

- At any point on an *x-t* graph, the instantaneous *x*-velocity is equal to the slope of the tangent to the curve at that point.



As the average *x*-velocity $v_{av\text{-}x}$ is calculated over shorter and shorter time intervals ...

... its value $v_{av\text{-}x} = \Delta x/\Delta t$ approaches the instantaneous *x*-velocity.

The instantaneous *x*-velocity v_x at any given point equals the slope of the tangent to the *x-t* curve at that point.

Acceleration

Checklist

✓ sign up for MasteringPhysics

✓ sign up for PollEverywhere

✓ go to lab this week

- bring a BLUE bubble sheet,
- and a #2 PENCIL

✓ complete homework #0 by Friday