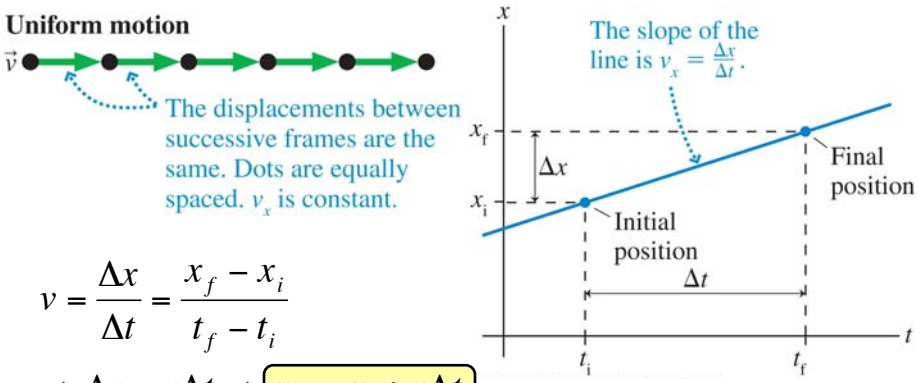
Announcements 9 Feb 09

- **Homework**
  - Homework #2 due on Friday by 8 am
  - Some problems are "end of chapter" problems, I.e. no hints are provided (more like an exam situation)
- **Learning Resource Center: help sessions on 10th floor DuBois library (run by Nikki Woodward)**
  - Time and location to be announced STARTS THIS WEEK

15

Uniform Motion

Straight-line motion with equal displacements during any successive equal-time intervals ➔ motion with constant velocity

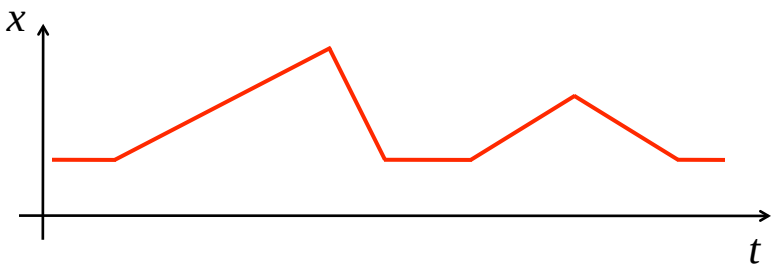


$$v = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

$$\Rightarrow \Delta x = v\Delta t \Rightarrow \boxed{x_f = x_i + v\Delta t}$$

16

Position-vs-time DEMO



Can you move according to this graph?

17

Problem Solving Example

A soccer player is 15 m from her opponent's goal. She kicks the ball hard; after 0.50 s, it flies past a defender who stands 5 m away, and continues toward the goal. How much time does the goalie have to move into position to block the kick from the moment the ball leaves the kicker's foot?

18

Problem Solving Example

Cleveland and Chicago are 340 miles apart by train. Train A leaves Cleveland going west to Chicago at 1:00 PM, traveling at 60 mph. Train B leaves Chicago going east to Cleveland at 2:00 PM, going 45 mph. At what time do the two trains meet? How far are they from Chicago at this time?

19

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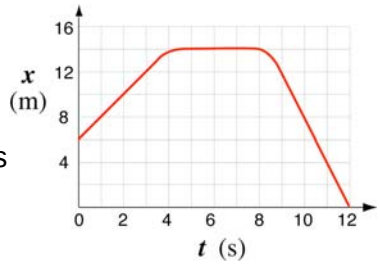
20

Motion with Changing Velocity (Part 1)

- **Average Velocity**

Can compute ratio between displacement and time interval for *any* pair of initial and final points



$$v = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

i.e. constant velocity an object would have to travel to achieve the same displacement over the same time interval

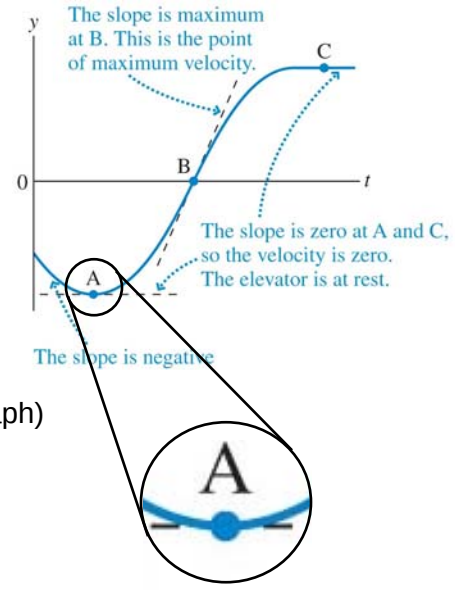
21

Motion of an elevator

- **Instantaneous Velocity**

Same calculation as before but over a *very short* time interval

$$v = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$



Instantaneous velocity at time t is the slope of the tangent line at that time (position-vs-time graph)

22

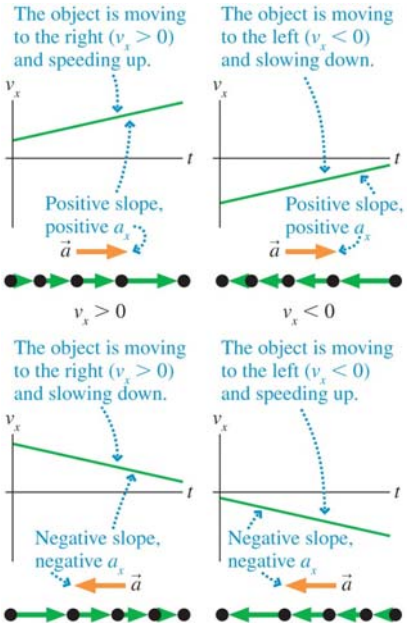
Acceleration

$$a_x = \frac{\Delta v_x}{\Delta t}$$

Acceleration is:

- The rate of change of velocity
- The slope of a velocity-versus-time graph

Which graph corresponds to this motion?



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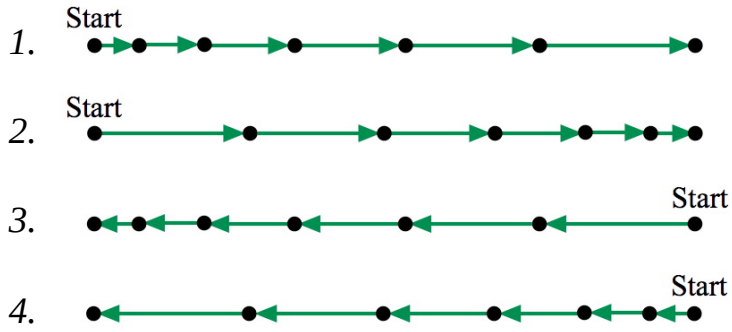
These four motion diagrams show the motion of a particle along the *x*-axis. Which motion diagrams correspond to a positive acceleration?



A. 1&2 **B. 3&4** **C. 1&3** **D. 2&4**

These four motion diagrams show the motion of a particle along the *x*-axis. Rank these motion diagrams such that the motion with largest acceleration is ranked first. There may be ties.

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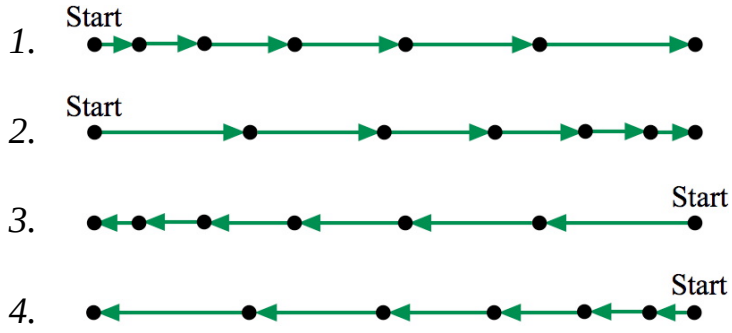
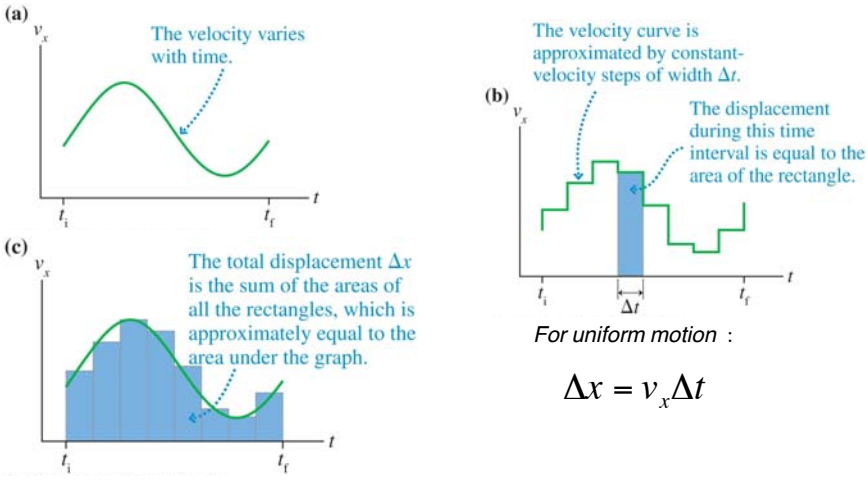


A. 1,2,3,4 B. 1&3,2&4 C. 1&4,2&3 D. 1,2,4,3

Motion with Changing Velocity (Part 2)

- **Displacement from velocity-vs-time graph**



For uniform motion :

$$\Delta x = v_x \Delta t$$

Displacement = area under the velocity-vs-time curve