Physics

Semester 1

Weeks 3 – 4

August 25 – September 5

Monday / Tuesday (8/25 – 26)

- Velocity practice problems
- Motion detector lab

Journal 1.1

- What are my strategies to succeed this school year?
- For each journal, you will need three things:
  - 1) write the date
  - 2) write the prompt (the question)
  - 3) write AT LEAST 4 sentences in response to the prompt.

- T: **5C** - describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, velocity, frames of reference, and acceleration
- O: I will be able to demonstrate my understanding of velocity and speed
- D: by completing a lab and a worksheet over the concepts.
- A: velocity, speed, displacement, distance
- Y: What does the slope of a distance vs time graph tell us?

Graphing distance vs time

- Always put the independent variable on the x-axis
- The slope of the line equals the velocity
  - Remember the slope formula ($\Delta y / \Delta x$)
  - Δ (delta) means change. Mathematically it means to subtract

Slope interpretation of distance vs time

- What is the slope of a horizontal line?
  - What does this mean about velocity
- What is the slope of a vertical line?
  - What does this mean about velocity?
- What does a positive slope look like?
  - What does this mean about velocity?
- What does a negative slope look like?
  - What does this mean about velocity?

Wednesday / Thursday (8/27 – 28)

- T: **5C - describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, velocity, frames of reference, and acceleration**
- O: I will be able to solve problems involving acceleration
- D: by applying the kinematic equations and the concepts we have discussed in class.
- A: acceleration, kinematics
- Y: How do you determine which formula to use?

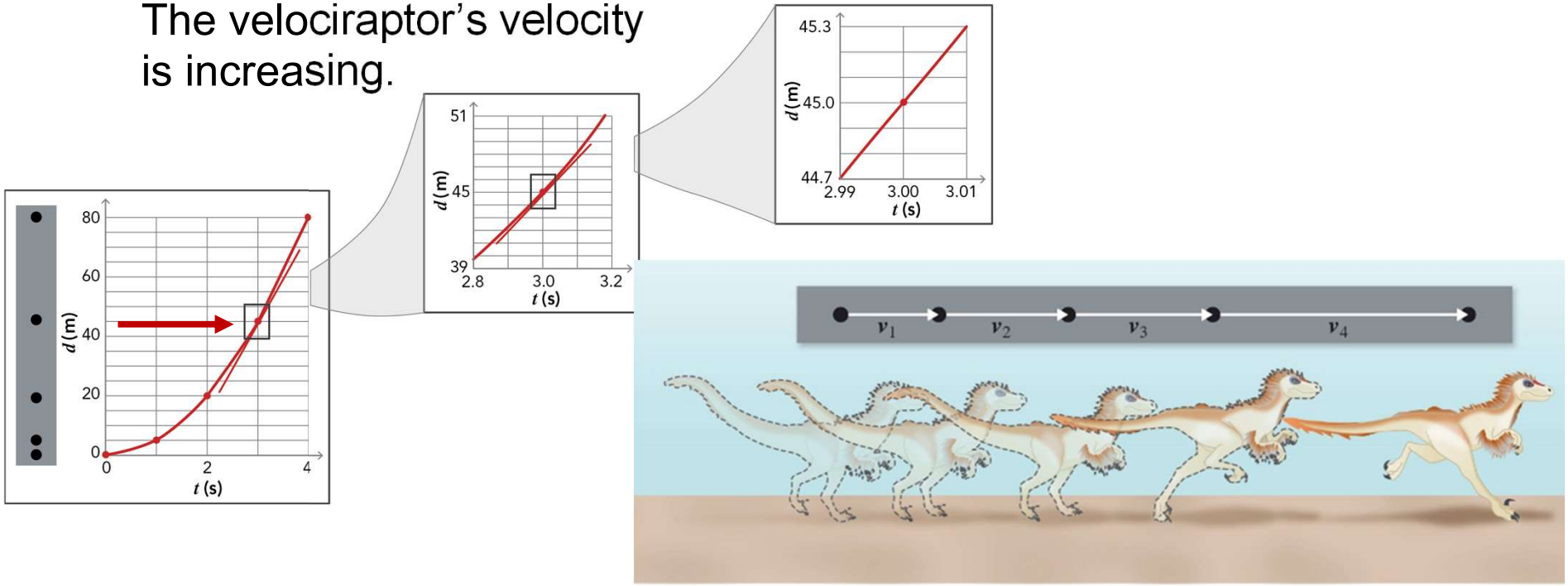
Acceleration

Photo Credit: Fstop/Photodisc/Getty Images

Instantaneous Velocity

Instantaneous velocity is the average velocity over an infinitesimally small time interval; it is the slope of the tangent line on a position graph.

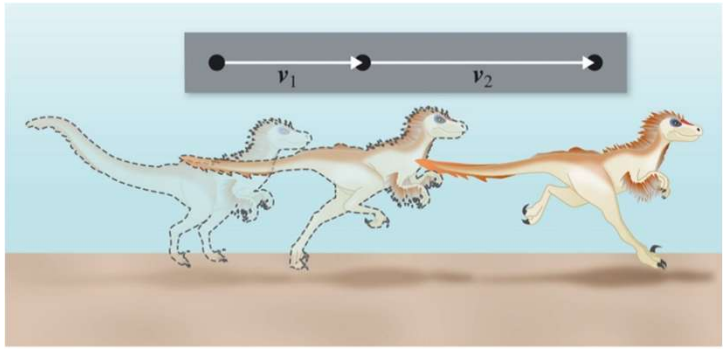
The velociraptor's velocity is increasing.

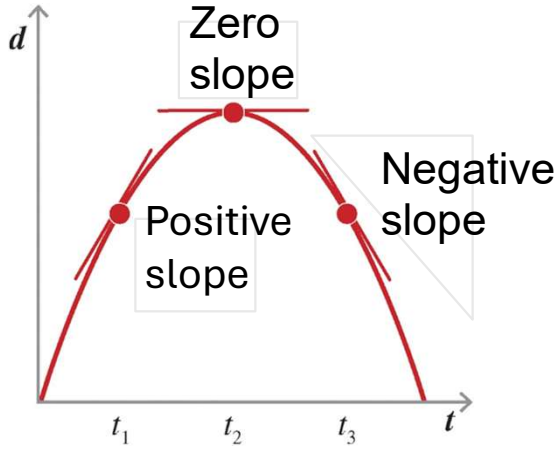


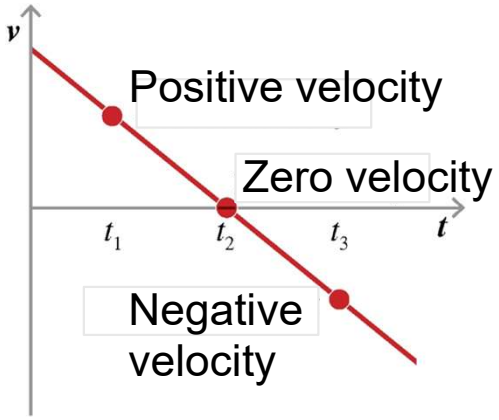
Graphs of Changing Velocity

The time derivative of a function is the rate at which the value of the function changes with time, which is the slope of the curve at that point.

Use the head-to-tail method to find Δv, the change in velocity of the velociraptor.







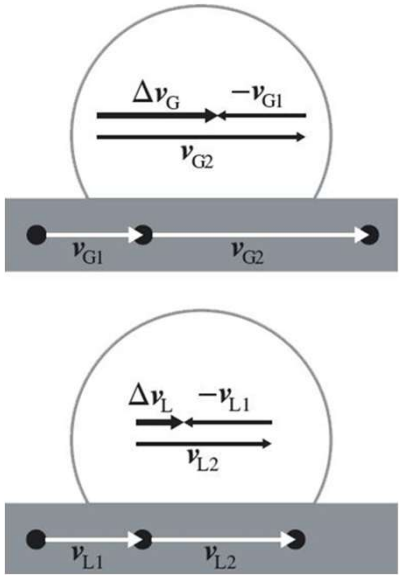
Acceleration

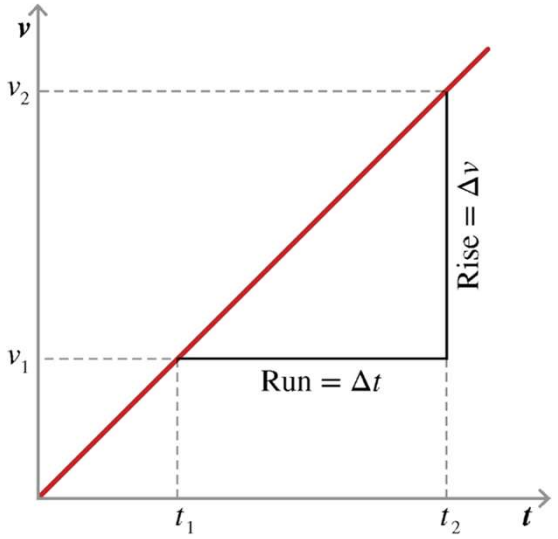
Acceleration is a vector that is the time derivative of velocity.

Use the head-to-tail method and the velocity vectors from a dot diagram to determine the direction of the acceleration.

$$a = \frac{v_2 - v_1}{t_2 - t_1} = \frac{\Delta v}{\Delta t}$$

a = acceleration
Δv = change in velocity
Δt = change in time



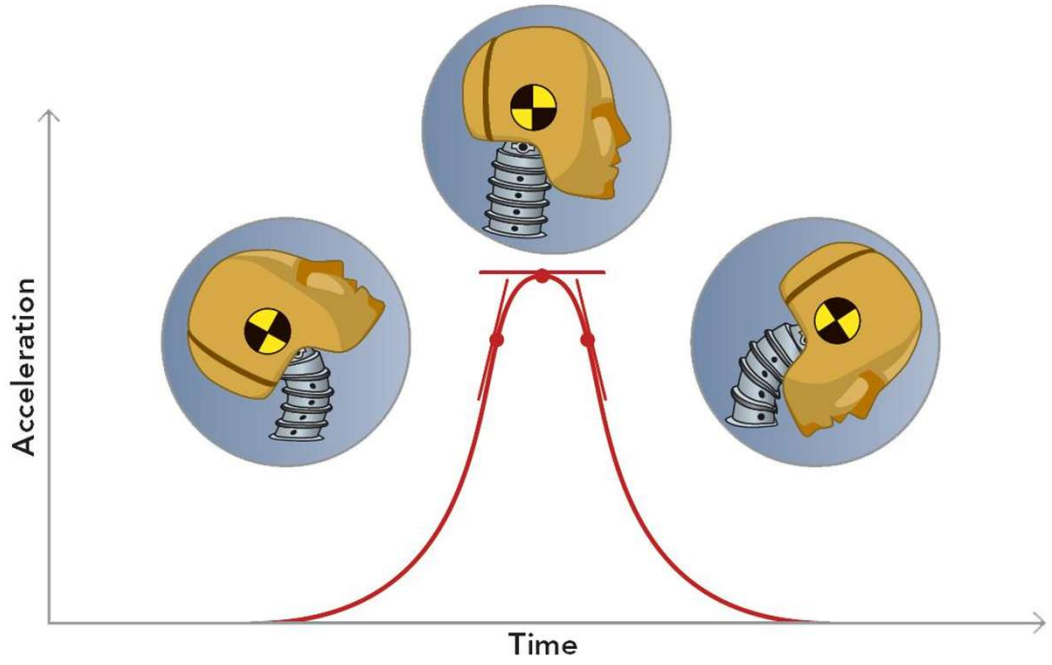


$$\text{Slope} = \frac{\text{Rise}}{\text{Run}} = \frac{\Delta v}{\Delta t}$$

Instantaneous Acceleration

Instantaneous acceleration is the average acceleration over an infinitesimally small time interval. The slope of the tangent at an instant on a velocity vs. time graph is the instantaneous acceleration.

Whiplash can occur in a car crash.



Constant Acceleration

The two equations that describe an object's velocity and displacement are called **equations of motion.**

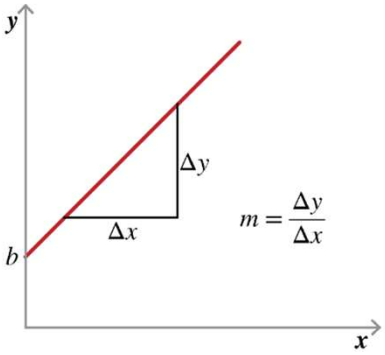
$$v = v_i + at$$

v = velocity
v_i = initial velocity
a = acceleration
t = time

$$\Delta d = v_i t + \frac{1}{2} at^2$$

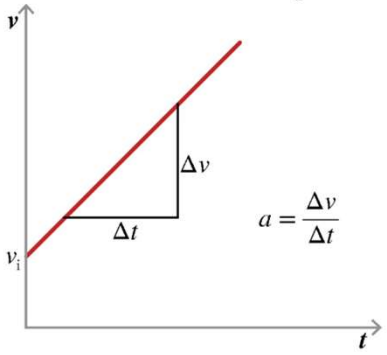
Δd = displacement
v_i = initial velocity
a = acceleration
t = time

$y = mx + b$

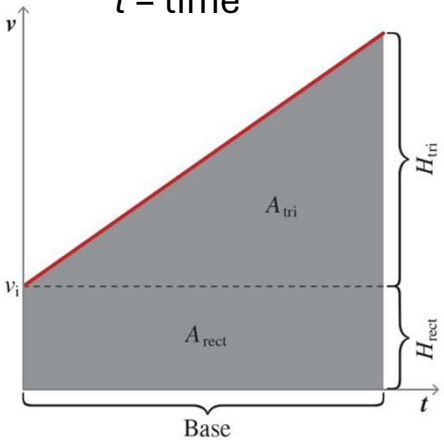


$$m = \frac{\Delta y}{\Delta x}$$

$v = at + v_i$



$$a = \frac{\Delta v}{\Delta t}$$



Acceleration Due to Gravity

A body in free fall experiences a constant acceleration toward the center of Earth called acceleration due to gravity, *g*, which has a constant magnitude of 9.8 m/s^2 toward the ground.

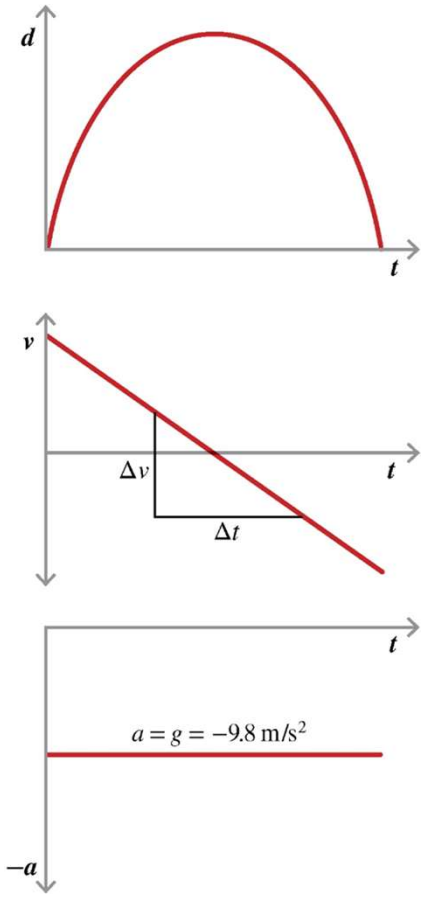


Photo Credit: Steve Prezant/Image Source/Getty Images

$$v = v_0 + at$$

$$\Delta x = (\frac{v + v_0}{2})t$$

$$\Delta x = v_0 t + \frac{1}{2}at^2$$

$$v^2 = v_0^2 + 2a\Delta x$$

Friday (8/29)

- C-day
- Finish the problems from last class

- T: **5C** - describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, velocity, frames of reference, and acceleration
- O: I will continue to expand my understanding of motion
- D: by working in small groups to finish my assignment(s) from previous classes.
- A: velocity, distance
- Y: What factors affect velocity?

Tuesday / Wednesday (9/2 – 3)

- Acceleration and Velocity more practice (word problems)

- T: 5C - describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, velocity, frames of reference, and acceleration
- O: I will be able to properly set up and solve distance, velocity, and 1-d acceleration problems
- D: by completing a mixed problem worksheet.
- A: velocity, distance, acceleration
- Y: How do you determine which formula to use for each word problem?

Thursday / Friday (9/4 – 5)

- Graphing with acceleration
- Explain free fall and up/down free fall

- T: **5C** - describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, velocity, frames of reference, and acceleration
- O: I will be able to describe acceleration from a graphic and mathematical standpoint
- D: by finishing the worksheet from last class, participating in a class discussion and class problems, and completing freefall problems.
- A: freefall, acceleration
- Y: How do we determine whether gravity is positive or

Graphs for Acceleration (velocity vs time)