Model Name:

Uniform Acceleration Particle Model

- **Description:**

  Particle moving with uniform acceleration

- **Properties:**

  - **Measured:**

    - Position (x) → m

      Time (t) → s

      Displacement ($\Delta \bar{x}$) → m

  - **Calculated:**

    Velocity ($\bar{v}$) → m/s

    acceleration ($\bar{a}$) → m/s^2 OR m/s/s

- Representations

Graphical

- Position-time
- Velocity-time
- acceleration-time

Motion Maps

- Velocity
- Acceleration

Mathematically

$$\bar{a} = \frac{\Delta \bar{v}}{\Delta t} = \frac{\bar{v}_f - \bar{v}_i}{t_f - t_i}$$

Written/Verbal Descriptions

- Rules of Behavior

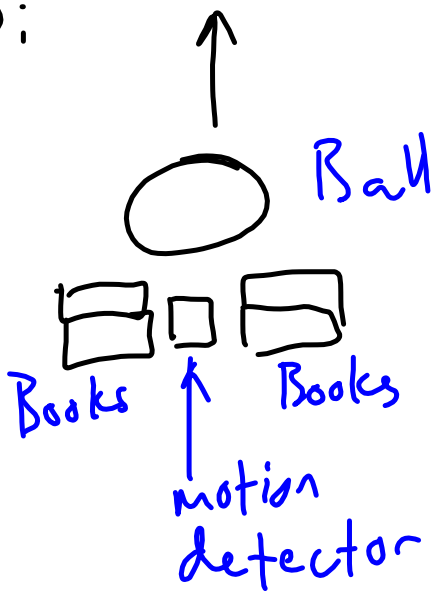
Velocity and acceleration are in the same direction, object speeds up

velocity and acceleration are in opposite directions, object slows down

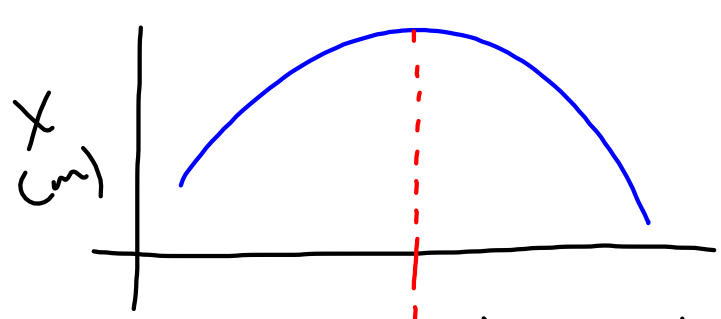
Function on an acceleration-time graph comes from the slope of a function in a velocity-time graph

Lab: Motion of Freely Falling Object

- Setup:

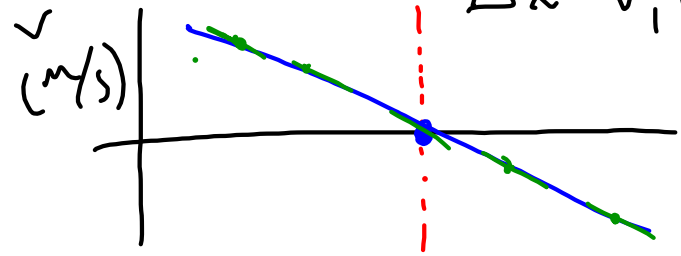


- Draw prediction
- Throw ball → Draw observation
- Curve fitting:
  - Quadratic on position-time
  - Linear on velocity-time

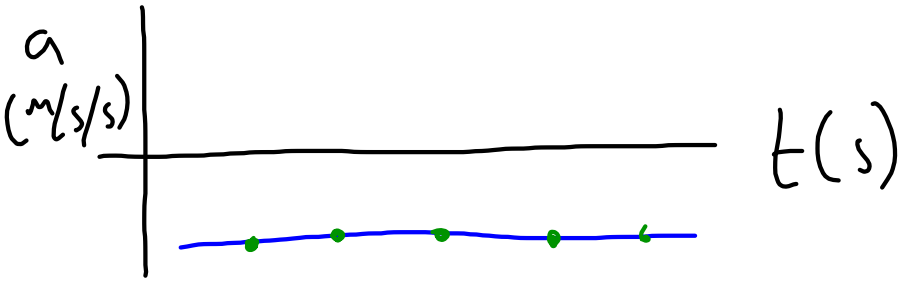


$-9x^2$
$-4.6x^2$
$-4.5x^2$
$-9.3x^2$

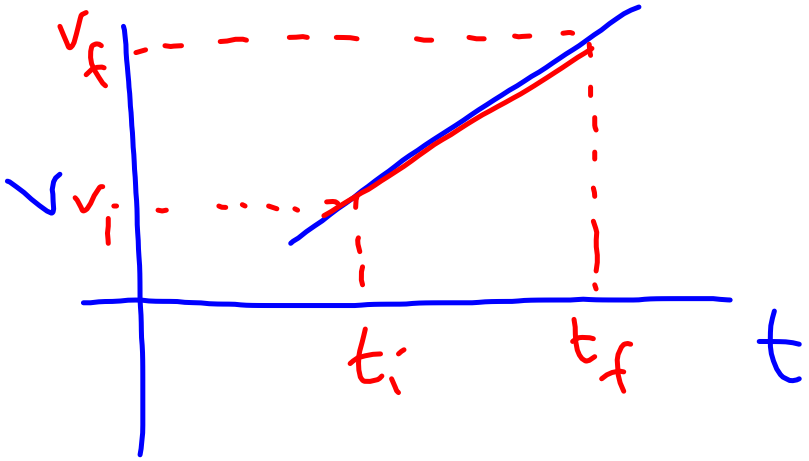
$\Delta x = v_i t + \frac{1}{2} a t^2$



$-9x$
$-8x$
$-9.8x$ $-8.4x$
$-7.2x$



	going up	at top	going down
position	+	+	+ (zero)
velocity	+	zero	−
acceleration	−	−	−


v_f
v_i
t_i
t_f
t