1 Defining Motion

Opening Demonstration: Observe constant velocity object.

- What is happening (qualitative)?
- Quantify what is happening in physics terms.

def. Motion:

- Relative position change with respect to time.

1.1 Descriptors of Motion

To describe motion we need information about how position changes with time.

def. Position (x)

- Shortest distance directed from point of reference to the object.
- Provides information about how far and what direction.
- Measured in meters.

def. Velocity (v)

- Rate of change in position with respect to time ($\frac{dx}{dt}$).
- Provides information about how fast an object is traveling in a particlular direction.
- Measured in $\frac{m}{s}$.
- This will be our primary descriptor of an object's state of motion until we discuss momentum.

def. Acceleration (a)

- Rate of change in velocity with respect to time ($\frac{dv}{dt}$).
- Provides information about how fast an object's velocity is changing in a particlular direction.
- Measured in $\frac{m}{s^2}$.
- This will be our primary descriptor of an object's change in state of motion.

1.2 1 Dimensional Motion

Motion that is 1D is restricted to left/right movement or up/down movement.

Notice that position, velocity, and acceleration all include direction in addition to magnitude. We must therefore use a sign convention to be able to distinguish up from down and left from right.

Sign Convention

- Up, right
  - positive (+)
- down, left
  - negative (-)

2 Representing Motion

We are interested in building a mathematical model to represent motion that is observed.

- Equations modeling motion.
- Graphs modeling motion.

Whether we use the equation to produce a graph or a graph to produce an equation both represent the mathematical modeling we will use to describe motion.