

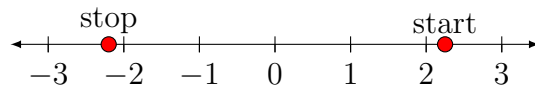
# University Physics 1A

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## Kinematics

Kinematics is the study of how things move. We study things by creating mathematical models for the motions of objects. We model each of our objects as a mass point.



Displacement:

$$\begin{aligned}\Delta x &= x_{final} - x_{initial} \\ &= -2.2m - 1.7m \\ &= -3.9m\end{aligned}$$

The path length may be different from the displacement. The average speed is how far it goes divided by how much time it takes. The average velocity is:

$$\text{average velocity} = v_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_{final} - x_{initial}}{t_{final} - t_{initial}}$$

$$\text{instantaneous velocity} = v = \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$$

Velocity measures how fast the position  $x$  is changing. It represents the rate of change of position with respect to time.

$$\text{average acceleration} = a_{avg} = \frac{\Delta v}{\Delta t}$$

$$\text{instantaneous acceleration} = a = \lim_{\Delta t \rightarrow 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt} = \frac{d^2x}{dt^2}$$

Acceleration measures how fast the velocity  $v$  is changing.

$$\begin{aligned}v &= \frac{dx}{dt} \\v dt &= dx \\ \int_{t_0}^{t_1} v dt &= \int_{x_0}^{x_1} dx = x_1 - x_0\end{aligned}$$

$$\begin{aligned}a &= \frac{dv}{dt} \\a dt &= dv \\ \int_{t_0}^{t_1} a dt &= \int_{v_0}^{v_1} dv = v_1 - v_0\end{aligned}$$

Complete the lab portion of the activities manual.

## Reminders and Homework

Complete the homework on TheExpertTA and WebAssign.

You can find all my notes at <http://omgimanerd.tech/notes>. If you have any questions, comments, or concerns, please contact me at [alvin@omgimanerd.tech](mailto:alvin@omgimanerd.tech)