PHYS 211X
General Physics I

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PHYS F211X

Day 1 - 1/18/2023

Grades

Homework	→	15%
Labs	→	15%
Paper	→	10%
Quiz	→	24% One quiz every week.
Midterm	→	15%
Final	→	21%

All labs are mandatory, failure to complete a lab will result in failing the course.

Calculus-based introduction to classical mechanics, including: kinematics, Newton's laws, momentum, work, energy, gravity, rotational motion, oscillations, and fluids. The laboratory part is integrated into the course.

Observations

Dropping things results in the falling. Several different objects of different masses, densities, and shapes were dropped. Do all of them take the same time to fall the same distance?

Laws ⇒ **Observation** ⇒ **Hypothesis**: ~~Do~~ they take the same time? $\overset{\checkmark}{\Longrightarrow}$ **Law**

We can **Observe**

1. Time
2. Mass
3. Length

Day 2 - 1/20/2023

Quantities: Scalars and Vectors

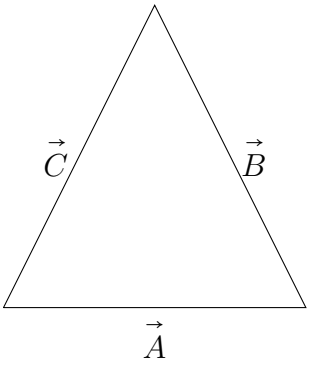
Scalar: Magnitude:

- 6ft of height
- 2 legs
- 1 hour of study

Vector: Magnitude + Direction:

- $\boxed{\text{Lower Campus}} \xleftarrow{500m} \boxed{\text{Reichard}} \xrightarrow{500m} \boxed{\text{Upper Campus}}$

- Denoted by a $\rightarrow$ over the letter: $\vec{A}$



Here, $\vec{A} + \vec{B} = \vec{C}$. We take the tail of $\vec{B}$ and place it at the head of $\vec{A}$, making $\vec{C}$.

Displacement

The distance from one point to the other, Δs.

Day 3 - 1/23/2023

Velocity

A vector from A to B; a speed with direction. The first derivative of position:

$$v = \dot{s} = \frac{\mathrm{d}s}{\mathrm{d}t} = \frac{\Delta s}{\Delta t} = \frac{s_2 - s_1}{t_2 - t_1}$$

Acceleration

The first derivative of velocity, second derivative of position:

$$a = \ddot{s} = \frac{\mathrm{d}^2 s}{\mathrm{d}t^2} = \frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$$

Examples

A ball is thrown up with $v = 40\,\mathrm{m/s}$. The velocity is recorded in 1 second increments as: $\{40, 30, 20, 10, 0\}$. What is the acceleration?

We set $v_2 = 0$ as it's the last velocity and $v_1 = 40$ as it's the first velocity.

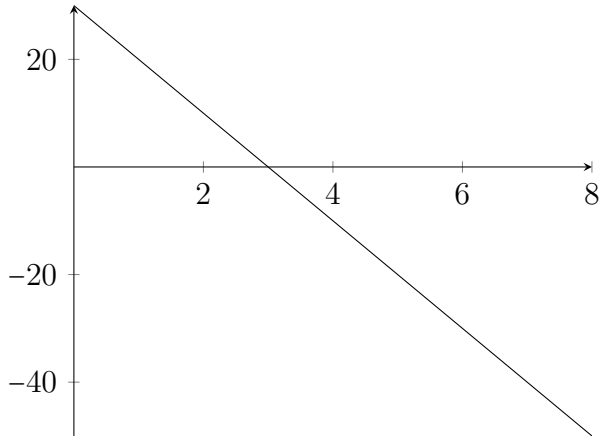
$$N = 5, \Delta t = 1: \quad v_1 = 0, \quad t_2 = \sum_{i=1}^{N-1} \Delta t = 4$$

$$\frac{v_2 - v_1}{t_2 - t_1} \implies \frac{0 - 40}{4 - 0} = -10$$

Therefore, the acceleration is: $\boxed{a = -10\,\mathrm{m/s^2}}$

Day 4 - 1/25/2023

Pictorial

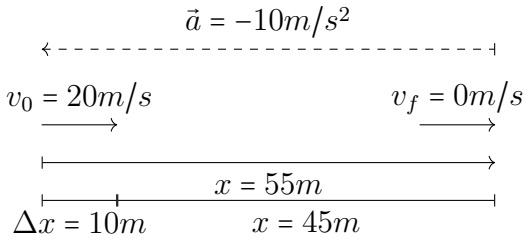


SI Units

Significant Figures(Sig. Figs)

Day 5 - 1/30/2023

Motion in One Direction



Motion on Incline