

## AI Response:

Kinematics is a branch of classical mechanics that describes the motion of objects.

Key concepts in kinematics include:

1. **Displacement**: The vector quantity that defines the change in position of an object.  
$$\Delta x = x_f - x_i$$
2. **Distance**: The scalar quantity that represents the total length of the path traveled by an object.  
$$d = \text{total path length}$$
3. **Velocity**: The vector quantity that represents the rate of change of displacement.  
$$v_{\text{avg}} = \frac{\Delta x}{\Delta t}$$
  
where  $\Delta x$  is the change in position and  $\Delta t$  is the time interval.
4. **Speed**: The scalar equivalent of velocity, representing how fast an object is moving.  
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$
5. **Acceleration**: The vector quantity that represents the rate of change of velocity.  
$$a = \frac{\Delta v}{\Delta t}$$
  
where  $\Delta v$  is the change in velocity and  $\Delta t$  is the time interval.
6. **Equations of Motion**: For uniformly accelerated motion (constant acceleration).  
$$v = u + at$$
  
$$s = ut + \frac{1}{2}at^2$$
  
$$v^2 = u^2 + 2as$$
  
where:
  - $s$  is displacement
  - $u$  is initial velocity
  - $v$  is final velocity
  - $a$  is acceleration
  - $t$  is time
7. **Graphs of Motion**: Position vs. time, velocity vs. time, and acceleration vs. time.