PHYSICS – Kinematics (Part 2)

Equations of Motion (Derivation + Application)

- **Three equations for constant acceleration:**

1. $v = u + at$
   (Final velocity = initial velocity + acceleration × time)

2. $s = ut + \frac{1}{2}at^2$
   (Displacement = initial velocity × time + ½ × acceleration × time²)

3. $v^2 = u^2 + 2as$
   (Final velocity squared = initial velocity squared + 2 × acceleration × displacement)

- Use these equations when acceleration is constant and choose based on which variable (s, u, v, a, t) is missing.

- If the final velocity is known and you need the initial: $u = v - at$.

Kinematics Graphs (v–t, x–t, a–t)

- **v–t graph:**

- Area under the graph gives displacement.

- Slope gives acceleration.

- **x–t graph:**

- Slope gives velocity.

- **a–t graph:**

- Area under the graph gives change in velocity.

Relative Velocity (1D)

- Relative velocity is just the difference between velocities if both objects move along the same straight line.

- If both head in same direction: $v_{rel} = v_1 - v_2$.

- Opposite directions: $v_{rel} = v_1 + v_2$.