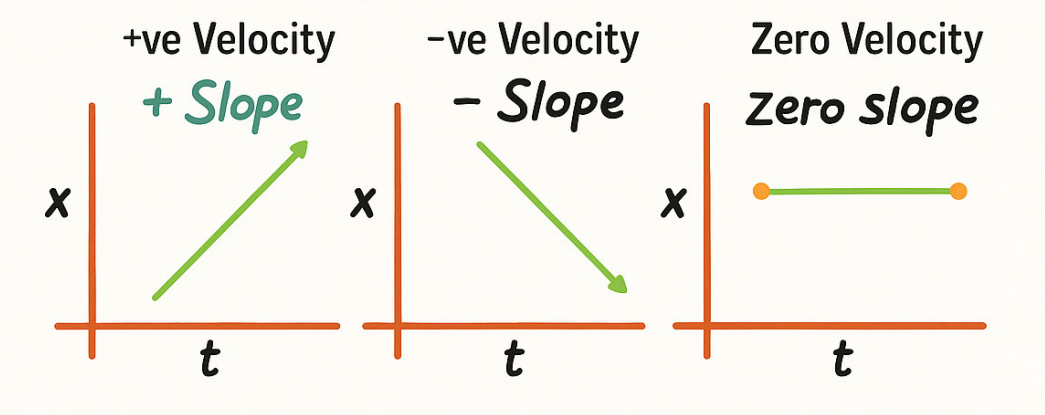
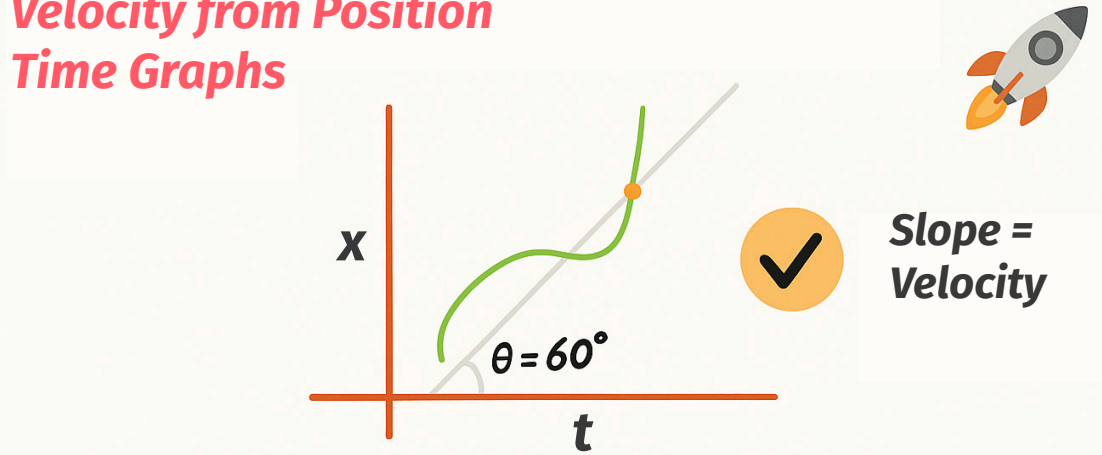


# 2. Mind Map: Velocity and Speed

## Velocity from Position Time Graphs



Velocity: same as displacement  
Speed: ignores direction

Velocity: can differ from speed  
Speed: equal to or greater than velocity

Constant velocity = constant speed  
Constant speed  $\neq$  constant velocity

Velocity can be zero (if returns to start)  
Speed must be  $> 0$  if moving

### Average Speed & Velocity

#### Average Speed

Total *distance* divided by total time. It is a scalar quantity, always positive or zero

$$s_{avg} = d / (t_2 - t_1)$$

#### Average Velocity

Displacement divided by time. It is a vector quantity

$$v_{avg} = (x_2 - x_1) / (t_2 - t_1)$$

Slope of line connecting two points on position-time graph is the average velocity between the two points

- Slope =  $(x_2 - x_1) / (t_2 - t_1) = v_{avg}$
- $v_{avg} = \tan(\theta)$

$\theta$  is the angle the line makes with the time axis

Can be negative, positive, or zero

- Positive slope = Displacement in +ve direction
- Negative slope = Displacement in -ve direction
- $v_{avg}$  vector always points in the same direction as the displacement direction

### Speed Vs. Velocity

#### 1. Direction

#### 2. Magnitude

#### 3. Constancy

#### 4. Zero Value

#### 5. Multiple Values

#### 6. Varying Motion

Velocity: single value between two points  
Speed: can vary with different paths

Velocity can vary without speed varying  
If speed varies, velocity magnitude changes