

# Index and Kinematics

d is for displacement, unit is m

change in displacement per unit time

V is for velocity, unit is m/s

\*  $V_1$  = initial velocity, rest means  $V_1 = 0$

$V_2$  = final velocity, stop means  $V_2 = 0$

change in velocity per unit time

a is for acceleration, unit is m/s<sup>2</sup>

t is for time, unit is seconds

V<sub>av</sub> is average velocity, unit is m/s

Formula: (acceleration is constant)

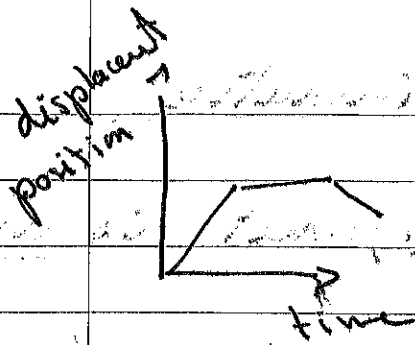
①  $V_{av} = \frac{V_1 + V_2}{2}$  ← { Average velocity  
 $V_1$  = initial velocity  
 $V_2$  = final velocity

②  $d = V_{av} \times t$  ← { displacement

③  $d = \left(\frac{1}{2} a t^2\right) + (V_1 t)$  ← { displacement  
 $V_1$  = initial velocity

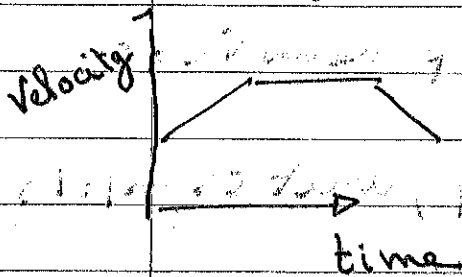
④  $V_2 = V_1 + a t$  ← {  $V_2$  is the final velocity  
or  $a = \frac{V_2 - V_1}{t}$

⑤  $V_2^2 = V_1^2 + 2 a d$



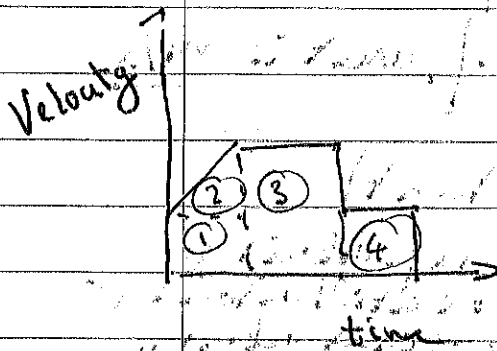
slope = velocity  
 if slope < 0, the motion is @ left  

$$\text{velocity} = \frac{\text{change of position}}{\text{change of time}}$$



slope = acceleration  
 if slope > 0, the velocity decreases (speed ↓; slowing down)  

$$\text{acceleration} = \frac{\text{change of velocity}}{\text{change of time}}$$



Area below graph  
 velocity vs time = displacement = Add the Areas of shapes  
 total displacement = Area 1 + Area 2 + Area 3 + Area 4

\* triangle:  $\frac{1}{2} \times b \times h$

\* rectangle =  $h \times b$