5. Accelerated Motion

a-1) Velocity & Time graphs.

- Uniform velocity
- Uniform acceleration
- Non-uniform acceleration

- area = distance.
- gradient = acceleration.

a-2) Deriving equations of motion.

1) \( a = \frac{v - u}{t} \)

\[ v - u = at \]
\[ v = u + at \]

2) \( s = \frac{1}{2} (v + u) t \)

\[ s = \frac{1}{2} (u + at + u) t \]
\[ s = \frac{1}{2} (2u + at) t \]
\[ s = ut + \frac{1}{2} at^2 \]

3) \( v = u + at \)

\[ v^2 = (u + at)^2 \]
\[ v^2 = u^2 + 2uat + a^2 t^2 \]
\[ v^2 = u^2 + 2a (ut + \frac{1}{2} at^2) \]  \[\text{or} \quad s = ut + \frac{1}{2} at^2 \]
\[ v^2 = u^2 + 2as \]