

Solving Problems in Kinematics

Starter

1. A particle moving in a straight line passes the point A when $t = 0$. Its velocity, v m/s,

$$\text{satisfies: } v = \begin{cases} t(3-t) & \text{for } 0 \leq t \leq 3 \\ 6-2t & \text{for } t > 3 \end{cases}$$

where t is measured in seconds.

- (a) Find the distance travelled when the particle first comes to rest for $t > 0$.
- (b) Find the displacement after 4 seconds.
- (c) Find the time at which the particle returns to A .

Working: (a) Particle at rest $\Rightarrow v = 0$ so $t(3-t) = 0$
Since $t > 0$, $t = 3$

$$\begin{aligned} \text{So } \int_0^3 t(3-t)dt &= \int_0^3 (3t - t^2)dt \\ &= \left[\frac{3}{2}t^2 - \frac{1}{3}t^3 \right]_0^3 \\ &= \left(\frac{3}{2} \times 3^2 - \frac{1}{3} \times 3^3 \right) - (0 - 0) \\ &= 4.5 \text{ m} \end{aligned}$$

[Solutions to Starter and E.g.s](#)

Exercise

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