

①

The position of a particle is described by $x = 7.2 + 3.5t^3$, where t is in seconds and x is in meters.

- (1) Calculate the average velocity during the interval $t = 3.0\text{s}$ to $t = 4.0\text{s}$.
- (2) Calculate the instantaneous velocity at $t = 3.5\text{s}$.

(1) Solution

$$\Delta v = \frac{\Delta x}{\Delta t} = \frac{x - x_0}{t - t_0}$$

$$x(4.0\text{s}) = 7.2 + 3.5(4.0)^3 = 231.2$$

$$x(3.0\text{s}) = 7.2 + 3.5(3.0)^3 = 101.7$$

$$\Delta v = \frac{231.2 - 101.7}{4.0\text{s} - 3.0\text{s}} = 129.5 \text{ m/s}$$

$$\boxed{130 \text{ m/s}} \quad 2\text{-sig figs}$$

(2) solution

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$$x(t) = 7.2 + 3.5t^3$$

$$v(t) = 3.5(3)t^2$$

$$= 10.5t^2$$

$$v(3.5s) = 10.5(3.5s)^2 = 128.6 \text{ m/s}$$

$$\boxed{130 \text{ m/s}} \quad 2\text{-sig figs}$$