

Question 1

The position of an object moving along a straight line is given by:

$$s(t) = 3t^3 - 5t^2 + 2t \quad (\text{in meters, where } t \text{ is in seconds})$$

- (a) Find the velocity function $v(t)$.
- (b) Find the instantaneous velocity at $t = 2$ seconds.
- (c) Find the average velocity between $t = 1$ and $t = 2$.

Question 1 - Solution

We are given:

$$s(t) = 3t^3 - 5t^2 + 2t$$

(a) Velocity is the derivative of position:

$$v(t) = s'(t) = 9t^2 - 10t + 2$$

(b) Instantaneous velocity at $t = 2$:

$$v(2) = 9(4) - 10(2) + 2 = 36 - 20 + 2 = 18$$

Answer: $v(2) = 18 \text{ m/s}$

(c) Average velocity from $t = 1$ to $t = 2$:

$$\frac{s(2) - s(1)}{2 - 1} = s(2) - s(1)$$

Compute $s(2)$:

$$s(2) = 3(8) - 5(4) + 2(2) = 24 - 20 + 4 = 8$$

Compute $s(1)$:

$$s(1) = 3(1) - 5(1) + 2(1) = 3 - 5 + 2 = 0$$

$$\text{Average velocity} = \frac{8 - 0}{1} = 8$$

Answer: 8 m/s