

Question 2

The displacement of a car traveling along a straight road is given by

$$s(t) = 10t - 0.5t^2$$

where s is in meters and t is in seconds.

- (a) Find the average velocity of the car over the interval $[2, 6]$.
- (b) Find the instantaneous velocity at $t = 2$.
- (c) Sketch the displacement function and the secant and tangent lines described above.

Question 2 - Solution

We are given:

$$s(t) = 10t - 0.5t^2$$

(a) Average velocity on $[2, 6]$:

$$s(2) = 10(2) - 0.5(4) = 20 - 2 = 18$$

$$s(6) = 10(6) - 0.5(36) = 60 - 18 = 42$$

$$\text{Average velocity} = \frac{42 - 18}{6 - 2} = \frac{24}{4} = 6 \text{ m/s}$$

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

$$s'(t) = 10 - t \Rightarrow s'(2) = 10 - 2 = 8 \text{ m/s}$$

(c) **Interpretation:** The average velocity between $t = 2$ and $t = 6$ is 6 m/s. At $t = 2$, the car is moving faster than average at 8 m/s. We now sketch the curve with the secant line between $t = 2$ and $t = 6$, and the tangent line at $t = 2$.

