INSTANTANEOUS VELOCITY
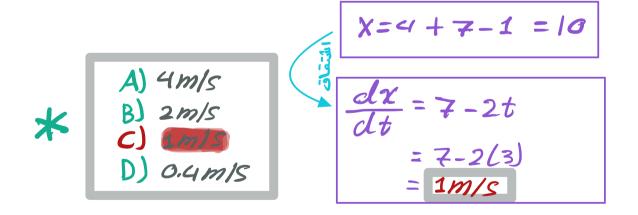
$$V = \frac{dx}{dt}$$

the Velocity in specific moment

The position of a particle moving on an x axis is given by $x = 4 + 7t - t^2$, with x in (m) and t in (s). The velocity at 3 s is:

$$X = 4 + 7 - 1 = 10$$

A) 4 m/s
B) 2 m/s
C) 1 m/s
D) 0.4 m/s

$$\frac{dx}{dt} = 7 - 2t$$
$$= 7 - 2(3)$$
$$= 1 \text{ m/s}$$

الطريقة

RULES FOR THE SIGN OF x-VELOCITY

TABLE 2.1 Rules for the Sign of x-Velocity

If x-coordinate is:	… x-velocity is:
Positive & increasing (getting more positive)	Positive: Particle is moving in $+x$-direction
Positive & decreasing (getting less positive)	Negative: Particle is moving in $-x$-direction
Negative & increasing (getting less negative)	Positive: Particle is moving in $+x$-direction
Negative & decreasing (getting more negative)	Negative: Particle is moving in $-x$-direction

Note: These rules apply to both the average x-velocity $v_{\text{av-}x}$ and the instantaneous x-velocity v_x (to be discussed in Section 2.2).

Average Velocity

$$\frac{\text{displacement}}{\Delta \text{time}} = \frac{\Delta x}{\Delta t}$$

ACCELERATION

Change of velocity during time

definition →

Average acceleration

↓

$$a_{avg} = \frac{V_2 - V_1}{t_2 - t_1} = \frac{\Delta V}{\Delta t}$$

unit → m/s^2

instantaneous acceleration

RULES FOR THE SIGN OF X-ACCELERATION

TABLE 2.3 Rules for the Sign of x-Acceleration

If x-velocity is:	... x-acceleration is:
Positive & increasing (getting more positive)	Positive: Particle is moving in $+x$-direction & speeding up
Positive & decreasing (getting less positive)	Negative: Particle is moving in $+x$-direction & slowing down
Negative & increasing (getting less negative)	Positive: Particle is moving in $-x$-direction & slowing down
Negative & decreasing (getting more negative)	Negative: Particle is moving in $-x$-direction & speeding up

Note: These rules apply to both the average x-acceleration $a_{av\text{-}x}$ and the instantaneous x-acceleration a_x.