Answer on Question#39898 – Physics - Mechanics

An object travelling in straight line with x=(tsquare-4t+8) m find average speed and average velocity in time interval t=0 to t=5

Solution:

Average velocity v_{avg} is the ratio of the displacement Dx that occurs during a particular time interval Dt to that interval:

$$v_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_2(t_2) - x_1(t_1)}{t_2 - t_1} = \frac{(5^2 - 4 \cdot 5 + 8) - (0^2 - 4 \cdot 0 + 8)}{5s - 0} = \frac{25m - 20m}{5s}$$
$$= 1\frac{m}{s}$$

Average speed s_{avg} is a different way of describing "how fast" a particle moves. Whereas the average velocity involves the particle's displacement Dx, the average speed involves the total distance covered (for example, the number of meters moved), independent of direction; that is,

$$v_{avg} = \frac{total\ distance}{\Delta t}$$

$$x(t) = t^2 - 4t + 8$$
$$V(t) = x'(t) = 2t - 4 = 0\ at\ t = 2s$$

Distance covered from $t = 0\ to\ t = 2\ is\ |x(2) - x(0)| = |(2^2 - 4 \cdot 2 + 8) - (0^2 - 4 \cdot 0 + 8)| = 4m$

Distance covered from $t = 2\ to\ t = 5\ is\ |x(5) - x(2)| = |(5^2 - 4 \cdot 5 + 8) - (2^2 - 4 \cdot 2 + 8)| = 9m$

$$v_{avg} = \frac{4m + 9m}{5s} = 2.6\frac{m}{s}$$

Answer: Average velocity is equal to $1\frac{m}{s}$;

Average speed is equal to $2.6\frac{m}{s}$.

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