

Answer on Question #51383, Physics - Mechanics - Kinematics - Dynamics

Question A proton moves along the x axis according to the equation $x = 62t + 14t^2$, where x is in meters and t is in seconds. Calculate (a) the average velocity of the proton during the first 3.0 s of its motion, (b) the instantaneous velocity of the proton at $t = 3.0$ s, and (c) the instantaneous acceleration of the proton at $t = 3.0$ s.

Solution (a) Average velocity is total displacement divided by total time.

$$\bar{v} = \frac{s}{t} = \frac{x = 62 \cdot 3 + 14 \cdot 3^2}{3} = 104 \text{ m/s}$$

(b) instantaneous velocity is

$$v(t) = x'(t) = 62 + 28 \cdot t$$

At $t=3.0$:

$$v(3) = 62 + 28 \cdot 3 = 146 \text{ m/s}$$

(c) instantaneous acceleration is

$$a(t) = v'(t) = 28$$

At $t=3.0$:

$$a(3) = 28 \text{ m/s}^2$$