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Section: (8-9) S

Physics 141

Quiz

Q1: a particle moves in a straight line such that its displacement with time $X(t) = t^3 - 5t^2 + 2$, where X in meters and t time in seconds.

a. Find the average velocity during the first two seconds.
b. Find the distance at which the particle changes its direction.
c. Find the instantaneous acceleration at t=3 seconds.

$\frac{5}{5}$

Q2: let **a** = 2i + 3j + 5k, **b** = 7i + 5j +3k, Find:

a. A vector perpendicular to vector **a** and vector **b**.
b. The angel between **a** and **b**.

$\frac{3}{5}$

Q1) a. $\vec{V}(t) = \frac{dx}{dt} = 3t^2 - 10t$ $\qquad \{ v(0) = 3(0)^2 - 10(0) = 0 \text{ m/s}$

$V(2) = 3(2)^2 - 10(2) = 12 - 26 = -8 \text{ m/s}$

$V_{avg} = \frac{V_2 - V_1}{t_2 - t_1} = \frac{-8 - 0}{2 - 0} = \frac{-8}{2} = -4 \text{ m/s}$

b. Particle changes direction at V=0

$\vec{V} = \frac{d\vec{x}}{dt}$

$3t^2 - 10t = 0$

$t(3t - 10) = 0$

$t = 0$, $\boxed{t = \frac{10}{3} \text{ sec}}$

$X\left(\frac{10}{3}\right) = \left(\frac{10}{3}\right)^3 - 5\left(\frac{10}{3}\right)^2 + 2 = \frac{-446}{27} \text{ m}$

c. $\vec{a}(t) = \frac{d\vec{v}}{dt} = 6t - 10$

$\vec{a}(3) = 6(3) - 10 = 18 \text{ m/s}^2$ 8 m/s²

Q1)a $\cancel{x(0) = t^3 - 5x}$

$X(0) = 0^3 - 5\cdot 0^2 + 2$
$= 2 \text{ m}$

$X(2) = 2^3 - 5(2)^2 + 2$
$= -10 \text{ m}$

$V_{avg} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{-10 - 2}{2}$
$= -6 \text{ m/s}$