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152 ← Serial No.

① $x = 8t^3$, $y = 4t^3 - 7t$ & $z = t + 3$, $t = \text{time}$

$$\therefore r = 8t^3 i + (4t^3 - 7t)j + (t + 3)k$$

$$\therefore \text{Velocity} = \frac{dr}{dt} = 24t^2 i + (12t^2 - 7)j + (1)k$$

$$\therefore \text{Velocity} = 24t^2 i + (12t^2 - 7)j + k$$

② Acceleration: $\frac{d^2 r}{dt^2} = 48t i + 24t j + 0$

$$\therefore \text{Acceleration} = 48t i + 24t j$$

②

$$x = 3t, \quad y = t^3, \quad z = t^2, \quad \& \quad t = 1$$

$$T = \frac{dr}{dt}$$

$$\frac{dr}{dt} \quad \therefore \boxed{r = xi + yj + zk}$$

$$r = 3t i + t^3 j + t^2 k$$

$$\frac{dr}{dt} = 3i + 3t^2 j + 2t k$$

$$\therefore \text{At } t=1 \quad \therefore \left| \frac{dr}{dt} \right| = \sqrt{(3)^2 + (3)^2 + (2)^2} = \sqrt{22}$$

$$\therefore T = \frac{\frac{dr}{dt}}{\left| \frac{dr}{dt} \right|} = \frac{3i + 3j + 2k}{\sqrt{22}}$$