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Question

- 1.) A particle moves along a curve $x=8t^3$, $y=4t^3-7t$ and $z=t+3$, where t is time. Find (i) velocity
(ii) acceleration

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

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

$$(ii) \text{ acceleration} = \frac{dv}{dt} = (48t)i + (24t)j$$

- 2) Find the unit tangent vector to the space curve

$$x=3t, y=t^3 \text{ and } z=t^2 @ t=1$$

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

$$r = xi + yj + zk \\ = (3t)i + (t^3)j + (t^2)k$$

$$\frac{dr}{dt} = 3i + (3t^2)j + (2t)k @ t=1$$

$$\frac{dr}{dt} = 3i + 3j + 2k ; \quad |dr/dt| = \sqrt{(3)^2 + (3)^2 + (2)^2} \\ = \sqrt{9+9+4} = \sqrt{22}$$

$$\therefore T = \frac{3i + 3j + 2k}{\sqrt{22}}$$