NAME : MUSTAPHA YAHAYA DANDUMA
DEPT : COMPUTER ENGINEERING
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1 A particle moves along a curve $x = 8t^3$ $y = 4t^3 - 7t$ and $z = t + 3$, where t is time find its

i) Velocity
ii) acceleration

i) for velocity along a curve

$x = 8t^3$

$y = 4t^3 - 7t$

$z = t + 3$

where t = time

Velocity $v = \frac{\Delta s}{\Delta t}$

Δs = change in position

Δt = change in time

where t = zero

$\therefore t = \frac{a}{z}$

$x = 8t^2$

$y = 4t^3 - 7t$

$z = t + 3$

$t = 1$

Let $P(x, y, z)$ be any point on the curve and

$\vec{r} = x + y + z$

be the position vector of P relative to O as origin

$\therefore \vec{r} = 8t^2 + 4t^3 - 7t + t + 3$

since velocity

$= v = \frac{\Delta s}{\Delta t}$

$\vec{r} = 8t^2 + 4t^2 - 7t + t + 3$

$v = \frac{d\vec{r}}{dt} = (8t) + (4t^2) - 7 + 2t + 3$

$8t + 4t^2 - 7 - 2t + 3$

now that time $t = 1$

substitute the value for $t = 1$

$\vec{v} = \frac{d\vec{r}}{dt} = 8(1) + (4(1))^2 - 7 - 2(1) + 3$

ii for acceleration

$\vec{a} = \frac{d\vec{v}}{dt} = \frac{d}{dt}(8t + (4t^2 - 7) - 2t + 3)$

$8t + (2t - 7) - 2t + 3$

$8t + (2t - 7) - 2t + 3$

$\vec{a} = \frac{d\vec{v}}{dt} = \frac{d}{dt} = (8t + 2t - 7 - 2t + 3)$

$\vec{a} = \frac{d\vec{v}}{dt} = \frac{d}{dt} = (8t + 2t - 7 - 2t + 3)$

2 find the unit tangent vector to the space curve

$x = 3t$

$y = t^3$

$z = t^2$

$t = 1$

$\vec{r} = x + y + z$

$\therefore \vec{r} = 3t + t^3 + t^2$

since velocity

$$v = \frac{\Delta s}{\Delta t}$$

$$\vec{F} = 3t + t^3 + t^2$$

$$v = \frac{d\vec{r}}{dt} = (3t) + t^3 + t^2$$

$$= 3t + t^3 + t^2$$

since our time $= 1$

then substitute the value of $t = 1$

$$\vec{v} = \frac{d\vec{r}}{dt} = 3(1) + (1)^3 + (1)^2$$

$$v = \frac{d\vec{r}}{dt} = 3 + 2^5$$