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Architecture

A particle moves along a curve
$x = t^2$, $y = 5t^2 + t$ $z = t + 7$
where t is time find its acceleration

$$\text{acceleration} = \frac{\Delta v}{t}$$

since we are dealing with position vectors.
let P(x, y, z) be any point on the given curve and $\vec{r} = x\hat{i} + y\hat{i} + z\hat{k}$ be the position vector of P relative to O as the origin
substituting x, y, z in $\vec{r}$
we have $\vec{r} = (t)\hat{i} + (5t^2 + t)\hat{j} + (1t + 7)\hat{k}$
so acceleration vector $\vec{a}$ will be differential of $\vec{r}$ with respect to t

$$\text{acceleration } \vec{a} = \frac{d\vec{r}}{dt} = 2t\hat{i} + 10t\hat{j} + \hat{k} //$$

$= (2, -3)(-4.9)m^2$

Date: .....

2. If $P = i - 9j - 4k$, $Q = 8i - 3j + 6k$, $R = i - 4j - 3k$, find $(P \times Q) \cdot (R \times P)$

$(P \times Q) = (i - 9j - 4k \times 8i - 3j + 6k)$

$= (8i - 27j - 24k)$

$(R \times P) = (i - 4j - 3k \times i - 9j - 4k)$

$= (0 - 36j - 12k)$

$(P \times Q) \cdot (R \times P) = (8i - 27j - 24k) \cdot (0 - 36j - 12k)$

$= 972j + 288k$ //

3. Given $\bar{r} = 5\cos 7t\, i - 2e^{3t} j - 4t^3 k$, find the integral of $\bar{r}$ with respect to t

$R = 5\cos 7t\, i - 2e^{3t} j - 4t^3 k$

$\int R\, dt = \frac{-5\sin 7t}{7} i + \frac{2e^{4t}}{34} j - \frac{4t^4}{4} k$