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DEPARTMENT: COMPUTER ENGINEERING

COURSE: MAT 102

MATRIC NO: 19/Eng02/011

ASSIGNMENT

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

i) Velocity.

$$r = xi + yj + zK$$

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

$$\text{Velocity} = \frac{dr}{dt} = \frac{d}{dt}(8t^3) + \frac{d}{dt}(4t^3 - 7t) + \frac{d}{dt}(t+3)$$

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

ii) Acceleration = $\frac{d^2r}{dt^2} = \frac{d}{dt} \frac{dr}{dt} = \frac{d}{dt}(24t^2) + \frac{d}{dt}(12t^2 - 7) + \frac{d}{dt}(1)$

$$\text{Acceleration} = 48ti + 24tj //$$

2) Find the unit tangent vector to the space curve $x=3t$, $y=t^3$ and $z=t^2$ at $t=1$

$$r = xi + yj + zK$$

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

$$\frac{dr}{dt} = \frac{d}{dt}(3t) + \frac{d}{dt}(t^3) + t \frac{d}{dt}(t^2) = 3i + 3t^2 + 2t$$

$$\frac{dr}{dt} = 3i + 2t \text{ at } t=1$$

$$\frac{dr}{du} = 3i + 3(1)j + 2(1)k = 3i + 3j + 2k$$

$$|\frac{dr}{du}| = \sqrt{(3)^2 + (3)^2 + (2)^2} = \sqrt{9+9+4}$$

$$= \sqrt{22}$$

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

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

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