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Math 102 Assignment

1.) (i) $x = 8t^3$ $y = 4t^3 - 7t$ $z = t + 3$

$$r = xi + yj + zk$$

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

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

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

(ii) Acceleration = $\frac{d^2r}{dt^2} = 48ti + 24tj + 0$

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

2.) $x = 3t$ $y = t^3$ $z = t^2$ $t = 1$

$$r = xi + yj + zk$$

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

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

At $t = 1$; $\frac{dr}{dt} = 3i + 3j + 2k$

$$|\frac{dr}{dt}| = \sqrt{(3)^2 + (3)^2 + (2)^2}$$

$$= \sqrt{9 + 9 + 4} = \sqrt{22}$$

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