

$$1) x = 8t^3, y = 4t^3 - 7t, z = t + 3$$

$$i) \text{ Velocity} = \frac{dr}{dt}$$

$$r = xi + yj + zk$$

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

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

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

$$2) T = \frac{dr/dt}{\left| \frac{dr}{dt} \right|}$$

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

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

at  $t = 1$

$$\frac{dr}{dt} = 3i + 3j + 2k$$

$$\left| \frac{dr}{dt} \right| = \sqrt{3^2 + 3^2 + 2^2}$$

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

$$\left| \frac{dr}{dt} \right| = \sqrt{22}$$

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