

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

$$D \quad \text{Velocity} = \frac{dr}{dt}$$

$$r = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$$

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

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

$$D \quad \text{Acceleration} \left(\frac{d^2r}{dt^2} \right) = 48t\mathbf{i} + 24t\mathbf{j} //$$

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

$$r = 3t\mathbf{i} + t^3\mathbf{j} + t^2\mathbf{k}$$

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

at $t = 1$

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

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

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

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

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