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Computer engineering

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

$$r = xi + yj + zk$$

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

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

acceleration,  $\frac{d^2r}{dt^2} = 48ti + 24tj$

2) unit tangent vector

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

$$|dr/du|$$

$$r = xi + yj + zk$$

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

$$= 3i + 3t^2j + 2tk$$

when  $k = 1$

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

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

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

$$= \sqrt{22}$$

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