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MAT 102

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

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

$$\text{Acceleration} = \frac{d^2r}{dt^2} = 48t\,i + 24t\,j + \blacksquare$$

2. $r = 3t\,i + t^3 j + t^2 k$

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

at $t = 1$

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

$$\left|\frac{dr}{dt}\right| = \sqrt{3^2 + 3^2 + 2^2} = \sqrt{9+9+4} = \sqrt{22}$$

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