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Biomedical Engineering.

$$1) x = 8t^3, y = 4t^3 - 7t \text{ and } z = t + 3.$$

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

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

Acceleration

$$\frac{d^2r}{dt^2} = 24t^2 i + (12t^2 - 7)j + k$$
$$= 48t i + 24j$$

$$2) x = 3t, y = t^3 \text{ and } z = t^2 \text{ at } t = 1$$

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

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

$$\text{at } t = 1$$

$$\frac{dr}{dt} = 2i + 3(1)^2 j + 2(1)k$$

$$= 2i + 3j + 2k$$

$$\left| \frac{dr}{dt} \right| = \sqrt{(2)^2 + (3)^2 + (2)^2}$$
$$= 4.12$$

$$T = \frac{2i + 3j + 2k}{4.12}$$