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

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

acceleration = $\frac{d^2 r}{dt^2} = 48t i + 24t j$

2 $x=3t$ $y=t^3$ $z=t^2$ at $t=1$ find the Unit tangent vectors to the space curve

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

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

~~$|\frac{dr}{dt}| \text{ at } t=1 = \sqrt{(3(1))^2 + (1)^2 + (1)^2}$
 $= \sqrt{9+1+1}$
 $= \sqrt{11}$~~

$|\frac{dr}{dt}| \text{ at } t=1 = \sqrt{3^2 + 3^2 + 2^2}$
 $= \sqrt{9+9+4}$
 $= \sqrt{22}$

$T = \frac{3i + 3t^2 j + 2t k}{\sqrt{22}} \text{ at } t=1$

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