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MAT 102

1) Velocity along curve x

$= \dot{x} = 8t^3$

$x = 8(3)t^2$

$x = 24t^2$

ii) Acceleration

$x = 24t^2$

$\ddot{x} = 24(2)t$

$\ddot{x} = 48t$

$y = 4t^3 - 7t$

velocity along a curve y

$\dot{y} = 4t^2 - 7t$

$\dot{y} = 4(3)t^2 - 7$

$\dot{y} = 12t^2 - 7$

Acceleration

$\ddot{y} = 12t^2 - 7$

$= 12(2)t - 7$

$= 24t - 7$

$z = 6 + 3$

Velocity along z

$\dot{z} = 1$

acceleration

$\ddot{z} = 1$

$\ddot{z} = 0$

2) Given

$F(t) = 3t(1)t^3(j) + t^2(k)$

Tangent vector $= \vec{r}(t) = 3(i) + 3t^2(j) + 2t(k)$ at $t = 1$

$\vec{r}(1) = 3(i) + 3(1)^2(j) + 2(1)(k)$

$\vec{r}(1) = 3i + 3j + 2k$

Tangent vector $= \langle 3, 3, 2 \rangle$

Finding the unit tangent vector we have $= \frac{v}{|v|}$

magnitude / length $= \sqrt{3^2+3^2+2^2}$

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

$= \sqrt{22}$

with tangent vector $= \frac{\langle 3, 3, 2 \rangle}{\sqrt{22}}$

with tangent vector $= \frac{\langle 3, 3, 2 \rangle}{\sqrt{22}}$

by splitting $= \frac{3}{\sqrt{22}}, \frac{3}{\sqrt{22}}, \frac{2}{\sqrt{22}}$

$\frac{3}{\sqrt{22}} \times \frac{\sqrt{22}}{\sqrt{22}}, \frac{3}{\sqrt{22}} \times \frac{\sqrt{22}}{\sqrt{22}}, \frac{2}{\sqrt{22}} \times \frac{\sqrt{22}}{\sqrt{22}}$

$= \frac{3\sqrt{22}}{22}, \frac{3\sqrt{22}}{22}, \frac{2\sqrt{22}}{22}$