Vector tri...

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Assignment

1.) $x = 7t^2,\ y = 6t^2 - 4t,\ z = t - 5$

$r = xi + yj + zk.$

$r = (7t^2)i + (6t^2 - 4t)j + (t-5)k.$

$\text{Velocity} = \frac{dr}{dt}$

$\frac{dr}{dt} = 14ti + (12t - 4)j + k.$

2.) $A = i + 2j - 4k,\ B = 2i - 3j + k,\ C = 4j - 3k$. Find $A \times (B \times C)$.

$\bar{B} \times \bar{C} = \begin{vmatrix} i & j & k \\ 2 & -3 & 1 \\ 0 & 4 & -3 \end{vmatrix}$

$= i\begin{vmatrix} -3 & 1 \\ 4 & -3 \end{vmatrix} - j\begin{vmatrix} 2 & 1 \\ 0 & -3 \end{vmatrix} + k\begin{vmatrix} 2 & -3 \\ 0 & 4 \end{vmatrix}$

$= i[9-4] - j[-6-0] + k[8-0]$

$= 5i + 6j + 8k.$

$A \times (B \times C) = \begin{vmatrix} i & j & k \\ 1 & 2 & -4 \\ 5 & 6 & 8 \end{vmatrix}$

$= i\begin{vmatrix} 2 & -4 \\ 6 & 8 \end{vmatrix} - j\begin{vmatrix} 1 & -4 \\ 5 & 8 \end{vmatrix} + k\begin{vmatrix} 1 & 2 \\ 5 & 6 \end{vmatrix}$

$= i[16+24] - j[8+20] + k[6-10]$

$= 40i - 28j - 4k.$

3.) $R = 4\sin 3t i + 4e^{3t} j + 7t^{3}k$.

$\int R = \int 4\sin 3t i + \int 4e^{3t} j + \int 7t^{3} k$.

$\int R = 4i \int \sin 3t + 4j \int e^{3t} + 7k \int t^{3}$.

$\int R = \frac{4i}{3}(-\cos(3t)) + \frac{4}{3}j \cdot e^{3t} + \frac{7}{4}k t^{4}$.

$\int R = -\frac{4\cos(3t)}{3} i + \frac{4e^{3t}}{3} j + \frac{7t^{4}k}{4}$,

4.) $A = 7i + 2j - k$, $B = 2i + j + 4k$, $C = i + j + k$, find $(A+C)\cdot(B-A)$.

$(A+C)\cdot(B-A) = [(7i + 2j - k) + (i + j + k)] \cdot [(2i + j + 4k) - (7i + 2j - k)]$

$= [8i + 3j + 0k] \cdot [-5i - j + 5k]$

$= -40 + 0 - 3$

$= -43$

5.) $x = t$, $y = t^2$, $z = t^3$. find a unit vector tangent at point where $t = 1$.

$T = \frac{\frac{dr}{dt}}{\left|\frac{dr}{dt}\right|}$

$r = xi + yj + zk$

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

$\frac{dr}{dt} = i + 2tj + 3t^2 k$ at $t = 1$, $\frac{dr}{dt} = i + 2tj + 3k^2 k$.

$= i + 2(1)j + 3(1)^2 k$

$= i + 2j + 3k$

$\left|\frac{dr}{dt}\right|_{t=1} = \sqrt{(i)^2 + (2j)^2 + (3k)^2}$

$= \sqrt{1^2 + 2^2 + 3^2}$

$= \sqrt{1+4+9}$

$= \sqrt{14} = 3.74$

Hence, $T = \frac{i + 2j + 3k}{3.74}$