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Matric No: 19/ENG05/042
Course Code: mat 102
Course Title: General mathematics II
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Assignment

1) $A = 5i - 7j - 6k$, $B = 5j + 4k$

$C = 9i - 4j + k$

$[-8(A+B) \times (C-A)]$

$A+B = \begin{vmatrix} 5 & -7 & -6 \\ 0 & 1 & 4 \end{vmatrix} = (5, -6, -2)$

$-8(A+B)$

$(-8 \times 5)\ (-8 \times (-6))\ (-8 \times (-2))$

$(-40, 48, 16$

$C-A = \begin{vmatrix} 9 & -4 & 1 \\ 5 & -7 & -6 \end{vmatrix} = (4, 3, 7)$

$-8(A+B) \times (C-A)$

$\begin{vmatrix} -40 & 48 & 16 \\ 4 & 3 & 7 \end{vmatrix}$

(1)

$$= -\begin{vmatrix} 48 & 16 \\ 3 & 7 \end{vmatrix} i$$

$$= \begin{vmatrix} -40 & 16 \\ 4 & 7 \end{vmatrix} j$$

$$= \begin{vmatrix} -40 & 48 \\ 4 & 3 \end{vmatrix} k =$$

$(48 \times 7 - 3 \times 16)i - (40 \times 7 - 4 \times 16)j$
$(-40 \times 3 - 4 \times 48)k$
$(366 - 48)i - (-280 - 64) + (120 - 192)$
$= 288i + (344j) + -312k$
$= 288i + 344j - 312k$

2) $\vec{r}(t) = (-3t \;\; 2t \;\; 4t^2)$

$\|\vec{r}(t)\| = \sqrt{(-3t)^2 + (2t^2) + (4t)^2}$

$= \sqrt{9t^2 \; 4t + 16t^2}$

$\hat{T}(t) = \dfrac{\vec{r}(t)}{\|\vec{r}\|} = \dfrac{1}{\sqrt{9t^2 + 4t + 16t^2}}$

$t = 1$

$\hat{T}(1) = \dfrac{1}{\sqrt{341}} (9, 4, 16) = \dfrac{1}{18.47} (9, 4, 16)$

$= \dfrac{9i + 4j + 16k}{18.47}$

3) $x = -8t^2$ $y = t^2 - 4t$, $z = t+1$

$r = x\hat{i} + y\hat{j} + z\hat{k}$

$\vec{r} = -8t^2\hat{i} + (t^2 - 4t)\hat{j} + (t+1)\hat{k}$

Velocity vector $v = \frac{d\vec{r}}{dt}$

$= (2x - 8t^{2-1})i + (2xt^{2-1} - 4)j + (1)k$

$= 16t\hat{i} + (2t-4)\hat{j} + k$

Assuming $t=1$

Vector $\vec{v} = \frac{d\vec{r}}{dt} = -16(1)\hat{i} + (2(1) - 4)\hat{j} + k$

Velocity $= -16\hat{i} + -2j + k$

4) $A = i + 2j - 4k$ $B = 2i - 3j + k$, $C = 4j - 3k$

Find $(A \times B) \times C$

$A \times B = \begin{vmatrix} i & 2 & -4 \\ 2 & -3 & 1 \end{vmatrix}$

$-[(2 \times 1 - (-3) \times (-4)]i$

$+[(1 \times 1) - 2 \times (-4)]j$

$-[(1 \times -3) - 2 \times 2]k$

$(2 - 12)i - (1 - 8)j + (-3 - 4)k$

$= (-10, 7, -7)$

$(A \times B) \times C \begin{vmatrix} -10 & 7 & -7 \\ 0 & 4 & -3 \end{vmatrix}$

$[7 \times (-3) - 4 \times 7]i$

$-[-10 \times (-3) - 0 \times (-7)]j$

$-[-10 \times 4 - 0 \times 7]k$

$(-21 - 28)i - (30 - 0)j + (-40 - 0)k$

$-49i, -30j, -40k$

5) $R = 4\sin 3t + 4e^{3t} + 7t^3 K$ Find the Integral of with respect to t

Solution:

$$\int R\,dt = \int (4\sin 3t)\,i + (4e^{3t})\,j + (7t^3)K\,dt$$

$$= (4\sin 3t)\,i\,dt + (4e^{3t})\,j\,dt + \int (7t^3)K\,dt$$

$$= \left(4 \times \frac{-1}{3}\cos 3t\right) i + \left(\frac{4}{3} \times \frac{1}{3} e^{3t}\right) j + \left(\frac{7t^4}{4}\right) K$$

$$\int R\,dt \left(\frac{-4}{3}\cos 3t\right) i + \left(\frac{4}{3}e^{3t}\right) j + \left(\frac{7t^4}{4}\right) K$$