MR PANDIOK SAMUEL OSUNIABASI
MATH 102 GENERAL MATHEMATICS II
DR OKUNLOLA
18/ENG09/004
AERONAUTICAL ENGINEERING

1 If $A = 5i - 7j - 6k$, $B = j + 4k$, $C = 9i - 4j + k$, find $-8(A+B)\cdot(C-A)$

$A + B = 5i \quad -7j \quad -6k$
$\quad + \; 0i \quad 1j \quad 4k$
$A + B = 5i \quad -6j \quad -2k$

$C - A = 9i \quad -4j \quad k$
$\quad\quad 5i \quad -7j \quad -6k$
$C - A = 4i \quad +3j \quad 7k$

$-8(A+B)\cdot(C-A) = (5\times4)i + (-6\times 3)j + (-2\times 7)k$
$= -8(20 - 18 - 14)$
$= -8(-12)$
$= 96$

2 Find a unit vector tangent to the space curve $x = -3t$, $y = t^2$, $z = 4t^3$ at the point where $t = 1$

$\vec{r}(t) = x = -3t, \; y = t^2, \; z = 4t^3$
$\vec{r}\,'(t) = -3, \; 2t + 12t^2$

~~Unit tangent vector~~ $= \cancel{\dfrac{-3, 2, 12}{\sqrt{-3^2 + 2^2 + 12^2}}} \cancel{= \dfrac{-3, 2, 12}{12\sqrt{53}}}$

$= -3, \; 2(1) + 12(1)^2$
$= -3, \; 2, \; 12$

unit vector $= \dfrac{-3, 2, 12}{\sqrt{-3^2 + 2^2 + 12^2}} = \dfrac{-3, 2, 12}{12\sqrt{53}}$

3 A Particle moves along a curve, $x = -8t^2$, $y = -4t$, $z = t+1$, where t is time. Find the acceleration

Solution

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

$\frac{dr}{dt} = -16t + -4 + t$

$\frac{d^2r}{dt} = -16 + 0 + 0$

$\frac{d^2r}{t} = -16$

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

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

$\cancel{A \times B = [illegible]}$

$\cancel{A \times B = [illegible]}$

$A \times B = (2 - 12)i - (1 - (-8))j + (-3 - 4)k$

$A \times B = -10i - 9j - 7k$

$$(A \times B) \times C = \begin{vmatrix} i & j & k \\ -10 & -9 & -7 \\ 0 & +4 & -3 \end{vmatrix}$$

$= [27 - (-28)]i - [30 - 0] + [48 - (-0)]$

$(A \times B) \times C = 55i - 30j + 40k$