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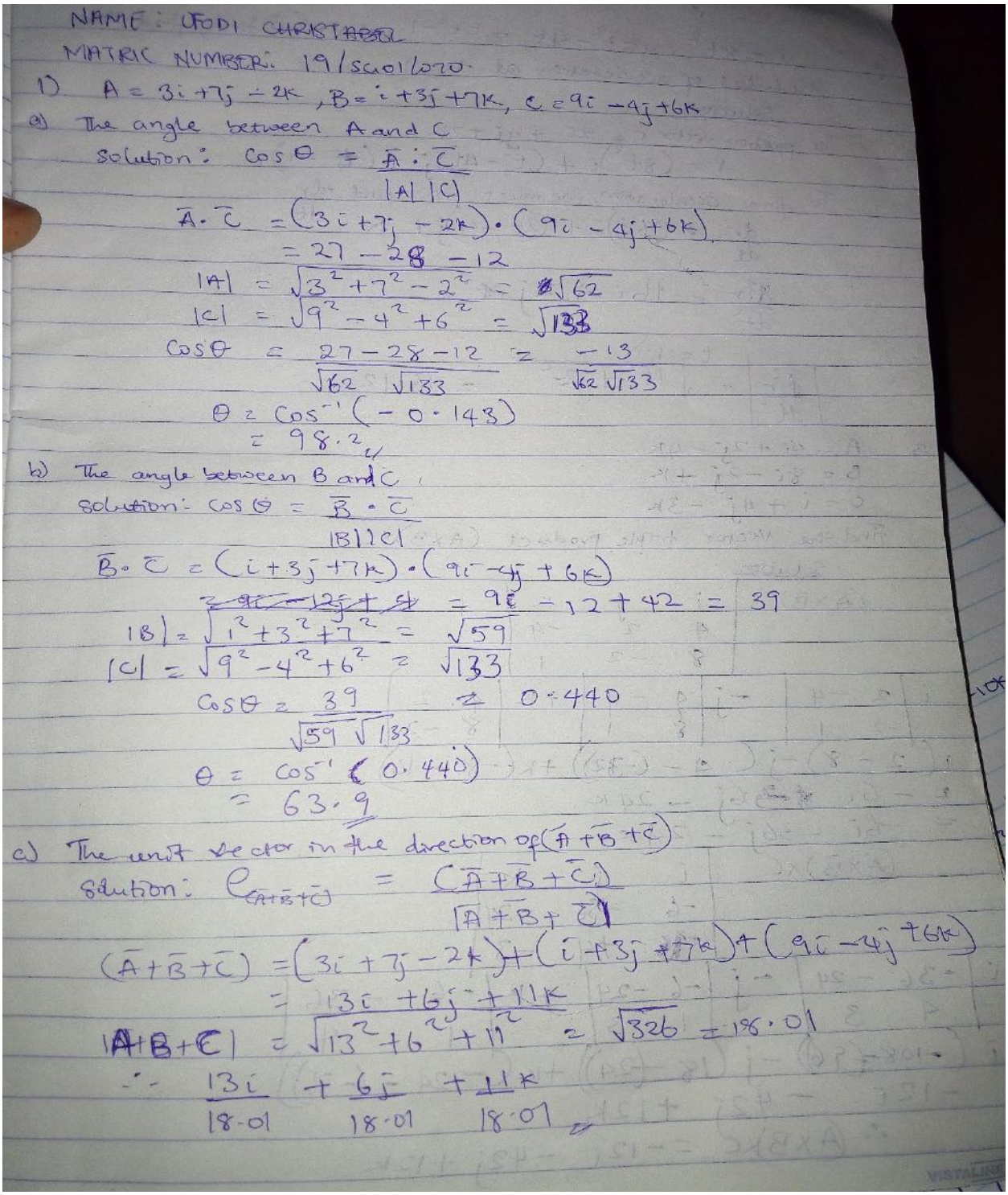
MATRIC NUMBER:19/sci01/070



2 $x = 8t^2$, $y = t^2 - 4t$, $z = t - 1$ where t is time, find the modulus of acceleration at $t = 1$

Solution

The position vector $r = xi + yj + zk$

$r = (8t^2)i + (t^2 - 4t)j + (t - 1)k$

To find acceleration, we must first find $\frac{dr}{dt}$

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

$\frac{d^2r}{dt^2} = 16i + 2j$

$\left|\frac{d^2r}{dt^2}\right| = \sqrt{16^2 + 2^2}$ at $t = 1$ $= 16.12$

3. $A = 4i + 2j - 4k$

$B = 8i - 2j + k$

$C = i + 4j - 3k$

Find the vector triple product $(A \times B) \times C$

Solution

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

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

$i(2 - 8) - j(4 - (-32)) + k(-8 - 16)$

$= -6i - 36j - 24k$

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$$(A \times B) \times C \begin{vmatrix} i & j & k \\ -6 & -36 & -24 \\ 1 & 4 & -3 \end{vmatrix}$$

$$i\begin{vmatrix} -36 & -24 \\ 4 & 3 \end{vmatrix} - j\begin{vmatrix} -6 & -24 \\ 1 & -3 \end{vmatrix} + k\begin{vmatrix} -6 & -36 \\ 1 & 4 \end{vmatrix}$$

$i(-108 - (-96)) - j(18 - (-24)) + k(-24 - (-36))$

$-12i - 42j + 12k$

$\therefore (A \times B) \times C = -12i - 42j + 12k$