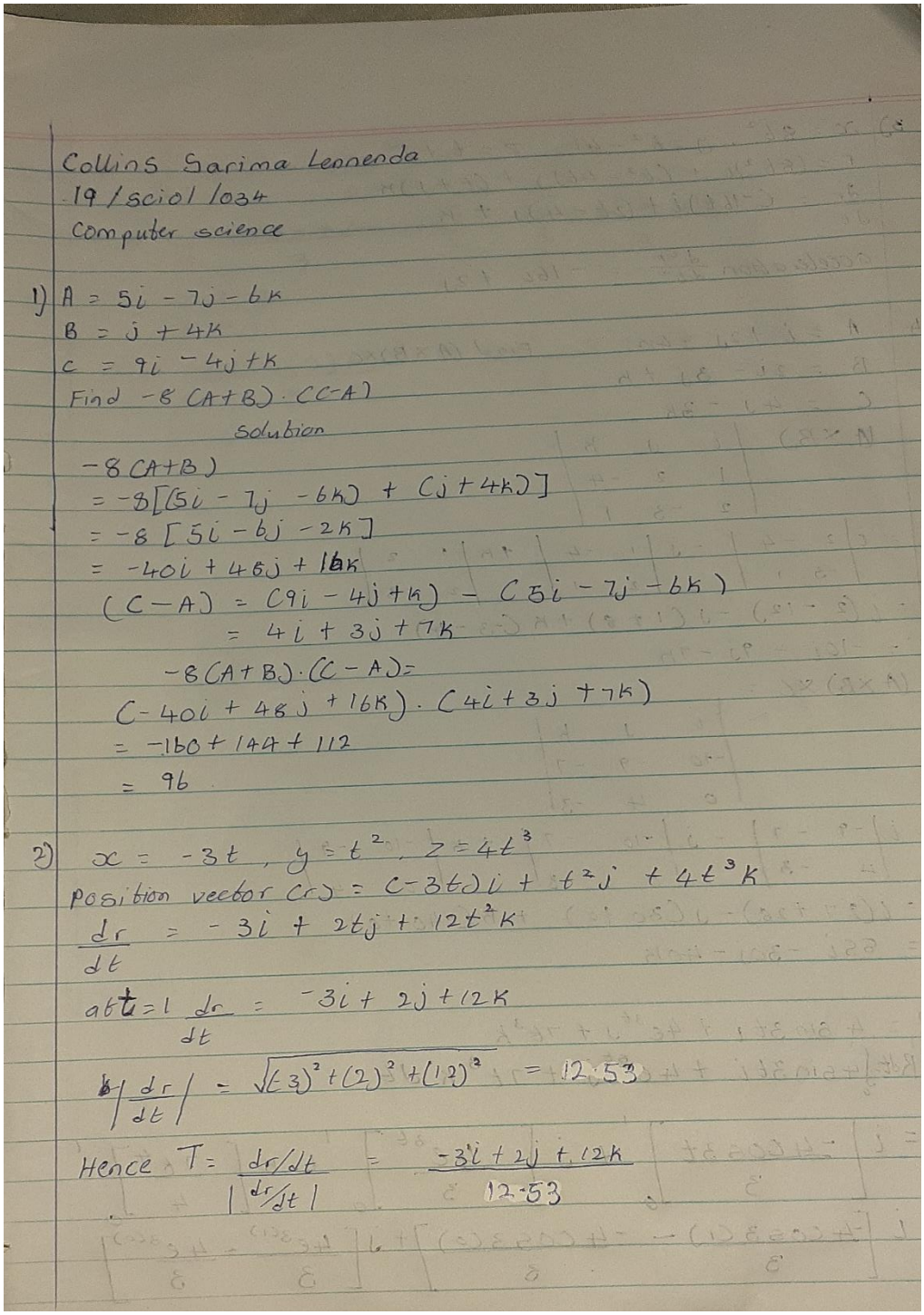
Collins Sarima Lennenda

19/SCI01/034



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19/sci01/034
Computer science

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

solution

$-8(A+B)$
$= -8[(5i - 7j - 6k) + (j + 4k)]$
$= -8[5i - 6j - 2k]$
$= -40i + 48j + 16k$

$(C-A) = (9i - 4j + k) - (5i - 7j - 6k)$
$= 4i + 3j + 7k$

$-8(A+B) \cdot (C-A) =$
$(-40i + 48j + 16k) \cdot (4i + 3j + 7k)$
$= -160 + 144 + 112$
$= 96$

2) $x = -3t, \quad y = t^2, \quad z = 4t^3$
Position vector $(r) = (-3t)i + t^2 j + 4t^3 k$
$\frac{dr}{dt} = -3i + 2tj + 12t^2 k$

at $t = 1 \quad \frac{dr}{dt} = -3i + 2j + 12k$

$\left|\frac{dr}{dt}\right| = \sqrt{(-3)^2 + (2)^2 + (12)^2} = 12.53$

Hence $T = \frac{dr/dt}{\left|dr/dt\right|} = \frac{-3i + 2j + 12k}{12.53}$

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

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

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

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

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

$B = 2i - 3j + k$

$C = 4j - 3k$

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

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

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

$= -10i - 9j - 7k$

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

$= i\begin{vmatrix} -9 & -7 \\ 4 & -3 \end{vmatrix} - j\begin{vmatrix} -10 & -7 \\ 0 & -3 \end{vmatrix} + k\begin{vmatrix} -10 & -9 \\ 0 & 4 \end{vmatrix}$

$= i(27 + 28) - j(30 + 0) + k(-40 + 0)$

$= 55i - 30j - 40k$

5 $R = 4\sin 3t\, i + 4e^{3t} j + 7t^3 k$

$\int_0^1 R\,dt = \int_0^1 4\sin 3t\, i + 4e^{3t} j + 7t^3 k\, dt$

$= i\left[\frac{-4\cos 3t}{3}\right]_0^1 + j\left[\frac{4e^{3t}}{3}\right]_0^1 + k\left[\frac{7t^4}{4}\right]_0^1$

$= i\left[\frac{-4\cos 3(1)}{3} - \frac{-4\cos 3(0)}{3}\right] + j\left[\frac{4e^{3(1)}}{3} - \frac{4e^{3(0)}}{3}\right]$

$+ k\left[\frac{7[1]^4}{4} - \frac{7[0]^4}{4}\right]$

$= i\left[\frac{-4\cos 3 + 4\cos(0)}{3}\right] + j\left[\frac{4e^3 - 4e^0}{3}\right] + k\left[\frac{7}{4}\right]$

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