

Akpokunio's Esetoloco

Computer science

1815MS0103

MAT 102 Assignment

1) Position vector $r = 7t^2 i + (6t^2 - 4t) j + (t - 5) k$
thus $r = (7t^2) i + (6t^2 - 4t) j + (t - 5) k$
Velocity $= dr/dt = (14t) i + (12t - 4) j + k$

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

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

$$i(9 - 4) - j(-6 - 0) + k(8 + 0) \\ = 5i + 6j + 8k$$

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

$$= 1(16 + 24) - j(8 - 10) + k(6 - 10) \\ = 40i + 2j - 4k$$

3) Given $R = 4 \sin 3t i + 4e^{3t} j + 7t^3 k$ find the
integrated of R with respect to t

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

$$\int R dt = -\frac{4}{3} \cos 3t i + \frac{4}{3} e^{3t} j + \frac{7t^{3+1}}{3+1} k \\ = -\frac{4}{3} \cos 3t i + \frac{4}{3} e^{3t} j + \frac{7t^4}{4} k$$

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

$$(A+C) = (7i + 2j - k) + (i + j + k) \\ = (7i + i) + (2j + j) + (-k + k)$$

$$A + C = 8i + 3j + 0k$$

$$B - A = (2i + j + 4k) - (7i + 2j - k)$$

$$B - A = (2i - 7i) + (j - 2j) + (4k - (-k))$$

$$= -5i - j + 5k$$

$$(A + C) \cdot (B - A) = (8i + 3j) \cdot (-5i - j + 5k)$$

$$= -40 - 3 + 0$$

$$= -43$$

5.) Find a unit vector tangent to the space curve $x = t$, $y = 2t^2$, $z = t^3$ at the point

where $t = 1$ position vector $r = 2i + 2j + 2k$

$$r = xi + yj + zk \quad \text{then} \quad r = ti + t^2j + t^3k$$

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

$$= \sqrt{1^2 + (2t)^2 + (3t^2)^2}$$

$$\text{where } t = 1$$

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

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

$$= \sqrt{14} \quad \approx 3.742$$

Hence $\hat{r} = \frac{i + 2j + 3k}{3.742}$