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COMPUTER ENGINEERING (19/ENG 02/054)

MAT 102

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1)  $\vec{r}(t) = (t, t^2, t^3)$  at  $t=1$

$$\vec{r}'(t) = (1, 2t, 3t^2)$$

$$|\vec{r}'(t)| = \sqrt{(1)^2 + (2t)^2 + (3t^2)^2}$$

$$= \sqrt{9t^4 + 4t^2 + 1}$$

$$T(t) = \frac{\vec{r}'(t)}{|\vec{r}'(t)|}$$

$$T(t) = \frac{(1, 2t, 3t^2)}{\sqrt{9t^4 + 4t^2 + 1}}$$

$$T(1) = \left( \frac{1}{\sqrt{9(1)^4 + 4(1)^2 + 1}}, \frac{2(1)}{\sqrt{9(1)^4 + 4(1)^2 + 1}}, \frac{3(1)^2}{\sqrt{9(1)^4 + 4(1)^2 + 1}} \right)$$

$$T(1) = \left( \frac{\sqrt{14}}{14}, \frac{\sqrt{14}}{7}, \frac{3\sqrt{14}}{14} \right)$$

2)  $A = 4t^3\mathbf{j} + 5\mathbf{k}$ ,  $B = 2t^2 + 4t\mathbf{j}$

$$C = A \times B = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 0 & 4t^3 & 5 \\ 2t^2 & 4t & 0 \end{vmatrix}$$

$$= \mathbf{i} \begin{vmatrix} 4t^3 & 5 \\ 4t & 0 \end{vmatrix} - \mathbf{j} \begin{vmatrix} 0 & 5 \\ 2t^2 & 0 \end{vmatrix} + \mathbf{k} \begin{vmatrix} 0 & 4t^3 \\ 2t^2 & 4t \end{vmatrix}$$

$$= (-20t + 0)i - j(0 - 10t^2) + (0 - 8t^3)k$$

$$C_1 = -20ti + 10t^2j - 8t^3k$$

$$\int_0^1 (-20ti + 10t^2j - 8t^3k)$$

$$= \left[ \frac{-20(1)^2}{2}i + \frac{10(1)^3}{3}j - \frac{8(1)^6}{6}k \right] - 0$$

$$= -10i + \frac{10}{3}j - \frac{4}{3}k$$