

1.

$$y = ti + t_j^2 + t^3 k$$

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

$$\left| \frac{dy}{dt} \right| = \sqrt{i^2 + 2j^2 + 3k^2}$$

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

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

$$= \sqrt{14}$$

$$t = \frac{i + 2j + 3k}{\sqrt{14}}$$

2.

$$A = 4t^3 i + 5k$$

$$B = 2t^2 j + 4t i$$

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

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

$$(0 - 20t)i - (0 - 10t^2)j + (0 - 8t^5)k$$

$$= -20ti + 10t^2j - 8t^5k$$

$$\int_0^1 [-20ti + 10t^2j - 8t^5k]$$

$$= [-20(1)i + 10(1)j - 8(1)k]$$

$$= -20i + 10j - 8k$$

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