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 MATH 102 ASSKWD

$$1) \quad r = t \quad y = t^2, \quad z = t^3$$

$$r = t\mathbf{i} + t^2\mathbf{j} + t^3\mathbf{k}$$

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

$$\frac{dr}{dt}$$

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

$$= \mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$$

$$\left| \frac{dr}{dt} \right| = \sqrt{(1^2 + 2^2 + 3^2)} = \sqrt{14}$$

$$T = \frac{dr/dt}{|dr/dt|} = \frac{\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}}{\sqrt{14}}$$

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

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

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

$$\mathbf{i}(-20t) - \mathbf{j}(-10t^2) + \mathbf{k}(-8t^5)$$

$$-20t\mathbf{i} + 10t^2\mathbf{j} - 8t^5\mathbf{k}$$

$$= \int -20t\mathbf{i} + 10t^2\mathbf{j} - 8t^5\mathbf{k}$$

$$\left[\frac{-20t^2}{2} + \frac{10t^3}{3} - \frac{8t^6}{6} \right]$$

$$\left[-10t^2\mathbf{i} + \frac{10t^3}{3}\mathbf{j} - \frac{4t^6}{3}\mathbf{k} \right]$$

$$\left[-10(1)^2\mathbf{i} + \frac{10(1)^3}{3}\mathbf{j} - \frac{4(1)^6}{3}\mathbf{k} \right] - \left[-10(0)^2\mathbf{i} + \frac{10(0)^3}{3}\mathbf{j} - \frac{4(0)^6}{3}\mathbf{k} \right]$$

$$\left(-10\mathbf{i} + \frac{10}{3}\mathbf{j} - \frac{4}{3}\mathbf{k} \right) - 0$$

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