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Computer engineering

1 $x = t, \; y = t^2 \; z = t^3$

$r = xi + yj + zk$

$r = ti + t^2 j + t^3 k$

$\frac{dr}{dt} = 1i + 2tj + 3t^2 k$

$|dr/dt| = \sqrt{(dx/dt)^2 + (dy/dt)^2 + (dz/dt)^2}$

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

$= \sqrt{14}$

unit tangent at $t = 1 = t(1) =$

$1 + 2(1) + 3(1)^2$

$= \frac{1+2+3}{\sqrt{14}} \quad = \frac{6}{\sqrt{14}}$

$= \frac{1 + 2j + 3k}{\sqrt{14}}$

2) $G = A \times B$

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

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

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

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

$i = [20t] - j = [10t^2] + k[8t^5]$

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

$$\int_0^1 20t - 10t^2 + 8t^5$$

$$\left[\frac{20t}{2} - \frac{10t^3}{3} + \frac{8t^6}{6}\right]_0^1$$

$$\left[10t - \frac{10t^3}{3} + \frac{4t^6}{3}\right]_0^1$$

$$\frac{10(1)}{1} - \frac{10(1)^3}{3} + \frac{4(1)^6}{3}$$

$$10 - \frac{10}{3} + \frac{4}{3}$$

$$= \frac{30-10+4}{3} = \frac{30-14}{3}$$

$$= \frac{24}{3} = 8$$ Square units