

NAME: OKWUOKWU BRYAN COURSE: MAT 102
 MATHS NO: 191EN6051046 DEPARTMENT: MECHATRONICS

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

$T = xi + yj + zk = ti + t^2j + t^3k$

unit vector tangent = $\frac{dT/dt}{|dT/dt|}$

$\frac{dT}{dt} = i + 2tj + 3t^2k \quad |dT/dt| = \sqrt{(1)^2 + (2t)^2 + (3t^2)^2}$

\therefore Unit tangent vector = $\frac{i + 2tj + 3t^2k}{\sqrt{1 + 4t^2 + 9t^4}}$ [but $t=1$]

\therefore Unit tangent vector = $\frac{i + 2j + 3k}{\sqrt{1 + 4 + 9}} = \frac{i + 2j + 3k}{\sqrt{14}}$

(2) $A = 4t^3j + 5k \quad B = 2t^2i + 4tj$

$G = \begin{vmatrix} i & j & k \\ 0 & 4t^3 & 5 \\ 2t^2 & 4t & 0 \end{vmatrix} = i(0 - 20t) - j(0 - 10t^2) + k(0 - 8t^5)$
 $= -20ti + 10t^2j - 8t^5k$

$\int_0^1 (-20ti + 10t^2j - 8t^5k) dt = \left[-10t^2i + \frac{10}{3}t^3j - \frac{4}{3}t^6k \right]_0^1$

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

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