

NAME: OMAMA MICHAEL OGAR
 DEPT: CIVIL ENGINEERING
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$$1) \quad r = xi + yi + zk$$

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

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

$$\text{At } t=1 \quad \frac{dr}{dt} = i + 2j + 3k$$

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

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

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

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

$$G = 16t^4$$

$$= \int_0^1 16t^4 dt$$

$$= \int_0^1 16t^5 + C$$

$$= \frac{16}{5}$$

$$\Delta u = \frac{6}{x^2 + 2x(\Delta x) + (\Delta x)^2} - \frac{6}{x^2}$$

$$\Delta u = \frac{-12x(\Delta x) - 6(\Delta x)^2}{x^4 + 2x^3(\Delta x) + x^2(\Delta x)^2}$$

$$\frac{\Delta u}{\Delta x} = \frac{-12x - 6(\Delta x)}{x^4}$$

$$\lim_{\Delta x \rightarrow 0} \left(\frac{\Delta u}{\Delta x} \right) = \lim_{\Delta x \rightarrow 0} \left[\frac{-12x - 6(\Delta x)}{x^4} \right]$$

$$\therefore \frac{du}{dx} = -\frac{12}{x^3}$$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$\frac{dy}{dx} = \cos u \times -\frac{12}{x^3}$$

$$\frac{dy}{dx} = -\frac{12 \cos u}{x^3}$$

Putting the value of u

$$\therefore \frac{dy}{dx} = -\frac{12 \cos \left(\frac{6}{x^2} \right)}{x^3}$$