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Section	A
Semester	Summer
Quiz	01
Department	Civil Engr.

Q2) Find  $\int_2^3 t \sin t^3 dt$

Sol<sup>n</sup>

Let  $u = t^3$

$$du = 3t^2 dt$$

$$dt = \frac{du}{3t^2}$$

Replace the value of  $t$  &  $dt$

$$= \int_2^3 \cancel{t} \sin u \frac{du}{3\cancel{t^2}}$$

$$= \int_2^3 \frac{1}{3} \sin u du$$

$$= -\frac{1}{3} \cos u \Big|_2^3$$

Replace  $u$  with  $t^3$

$$= -\frac{1}{3} \cos t^3 \Big|_2^3 \quad \text{Applying Limits}$$

$$= -\frac{1}{3} (\cos(3)^3 - \cos(2)^3)$$

$$= -\frac{1}{2} (\cos 9 - \cos 4)$$

$$= 0.0049 \quad \text{Ans.}$$

21) Find

$$\int_0^1 \frac{4t^3 - 2t^2 + 3t - 1}{2t^2 + 1} dt$$

Solve

$$\int \frac{x + 2t - 1}{2t^2 + 1} dt$$

$$\int \frac{x}{2t^2 + 1} dt - 2 \int t dt - \int 1 dx$$

$$= \int \frac{t}{2t^2 + 1} dt$$

Let

$$u = 2t^2 + 1 \Rightarrow \frac{du}{dt} = 4t$$

$$\Rightarrow dt = \frac{1}{4t} du$$

$$= \frac{1}{4} \int \frac{1}{4} du$$

$$= \int \frac{1}{4} du$$

$$= \ln(u)$$

$$= \ln \frac{2x^2 + 1}{4}$$

$$= \int x dx$$

$$= \int x^2 dx = \frac{x^{n+1}}{n+1} \quad n = 1$$

$$= \frac{x^2}{2}$$

$$\int (dx)$$

$$= x$$

$$\int \frac{t}{2t^2 + t} dt + 2 \int 1 dt - \int 1 dt$$

$$= \ln \frac{2t^2 + 1}{4} + t^2 - t$$

$$= \int \frac{4^3 - 2t^2 + 3t - 1}{2t^2 + t} dt$$

~~100~~

$\int = 206.0$

100000000

$$\ln \frac{t^2 + 1}{4} + (t^3 - t) + C$$

(2)

$$= \ln \frac{2n^2 + 1}{4} + (n - 1) + C$$

(3)

$$\ln \frac{2n^2 + 1}{4} \Big|_0^1 + n \Big|_0^1 - n \Big|_0^1$$

$$\ln 3 + 1 - 1 - \frac{\ln 1}{4} + 0 - 0$$

$$= \ln \frac{3}{4} \quad \text{Ans.}$$