ID # 16076 SECTION: "A" DATE 19 $\frac{09}{2020}$

ASSIGNMENT: APPLIED CALCULUS

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Q.1:- Find $\int_0^1 \frac{4t^3-2t^2+3t-1}{2t^2+1}\,dt$.

Sol:- Given that,

$$\int_0^1 \frac{4t^3-2t^2+3t-1}{2t^2+1}\,dt \longrightarrow (\star)$$

Given integrand in improper, So 1st we decompose eq ($\star$).

$$\begin{array}{r|l} & 2t-1 \\ \hline 2t^2+1 & \cancel{4t^3}-2t^2+3t-1 \\ & \underline{\pm\cancel{4t^3} \qquad \pm 2t} \\ & -\cancel{2t^2}+t-\cancel{1} \\ & \underline{\mp\cancel{2t^2} \qquad \mp\cancel{1}} \\ & t \end{array}$$

So, eq ($\star$) becomes,

$$\int_0^1 \frac{4t^3-2t^2+3t-1}{2t^2+1}\,dt = \int_0^1 \left(2t-1+\frac{t}{2t^2+1}\right)dt$$

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

$$= t^2\Big|_0^1 - t\Big|_0^1 + \frac{1}{4}\ln(2t^2+1)\Big|_0^1$$

$$= (1^2-0^2) - (1-0) + \ln(2(1)^2+1)^{1/4} - \ln(2(0)^2+1)^{1/4}$$

$$= \cancel{1} - \cancel{1} + 0.27465 - 0$$

$$= 0.27465 \text{ Ans}$$

Q.2:- Find $\int_2^3 t \sin t^2 \, dt$.

Sol:- Let $t^2 = u$

Then $2t = \frac{du}{dt} \Rightarrow t\,dt = \frac{du}{2}$

As $t \to 2$ Then $u \to 4$

& $t \to 3$ Then $u \to 9$

So the ~~?~~ given question will transform as,

$$\int_2^3 t \sin t^2 \, dt = \int_4^9 \sin u \frac{du}{2}$$

$$= \frac{1}{2}\int_4^9 \sin u \, du$$

$$= \frac{1}{2} \left| -\cos u \right|_4^9$$

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

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

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

$$= \frac{1}{2}(0.998 - 0.987)$$

$$= 0.0055 \quad \text{Ans.}$$