QUIZ = Calculus

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$\Rightarrow$ Find :-

Q1:- $\int_0^1 \frac{4t^3-2t^2+3t-1}{2t^2+1}\,dt$

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

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

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

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

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

$= \int_0^1 \frac{t(4t^2+3)}{2t^2+1}\,dt - [1-0]$

$= \int_0^1 \frac{t(4t^2+3)}{2t^2+1} - 1 \rightarrow (1)$

$\Rightarrow$ Now :~

= let $2t^2+1=y \Rightarrow 2t^2+1=y$

= As $t \to$ i-e $y=3$ $\quad 2t^2=y-1$

= $t \to 0$ i-e $y=1$ $\quad 4t^2=2y-2$

Now Diff $\quad 4t^2+3=2y-2+3$

$= 4t = dy/dt \quad 4t^2+3=2y+1$

$= dt = dy/dt$

$= \int_1^3 t \frac{(2y+1)}{4} \cdot dy/4t - 1$

$= \int^3 \frac{2y+1}{4y} dy - 1$

$= \frac{1}{4}\left[\int_1^3 \frac{2y\,dy}{y} + \int_1^3 \frac{1}{y} dy\right] - 1$

$= \frac{1}{4}\left[\int_1^3 2dy + \int_1^3 \frac{1}{y} dy\right] - 1$

$$\Rightarrow \frac{1}{4}\left[2y\Big|_1^3 + \ln y\Big|_1^3\right] - 1$$

$$\Rightarrow \frac{1}{4}\left[2(3) - 2(1) + \ln(3) - \ln(1)\right] - 1$$

$$\Rightarrow \frac{1}{4}\left[6 - 2 + 1.0986\right) - 1$$

$$\Rightarrow \frac{1}{4}\left[5.0986\right] - 1$$

$$\Rightarrow 1.27465 - 1$$

$$\boxed{\Rightarrow 0.2746}$$ Ans

Q2:-

$$\int_2^3 t \sin t^2 \, dt$$

Sol:-

Let $t^2 = y$

Diff w.r.t t^2

$$2t = dy/dt$$

$$dt = dy/2t$$

$t^2 = y$

$(3)^2 = y$

$9 = y$

Now

As $t \to 3$ then $y = \alpha$

As $t \to 2$ then $y = 4$

So $= \int_2^3 t \sin t^2 \, dt = \int_4^9 t \sin y \, dy/t$

$= \int_4^9 \sin y \, dy$

$= -\cos y \int_4^9$

$= -[\cos(9) - \cos(4)]$

$= -[0.9876 - 0.9775]$

$= -(-0.00987)$

$= +0.00987$: Ans