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Subject: Applied calculas

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

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

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

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

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

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

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

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

Now

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

= As $t \Rightarrow 1$ i.e $y=3$ $2t^2 = y-1$

$t \rightarrow 0$ i.e $y=1$ $4t^2 = 2y-2$

$4t^2+3=2y-2+3$

$4t^2+3=2y+1$

Now Diff

$= 4t = dy/dt$

$= dt = dy/4t$

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

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

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

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

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

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

$= \frac{1}{4}\left[6 - 2 + 1.0986\right] - 1$

$= \frac{1}{4}\left[6 - 2 + 1.0986\right] - 1$

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

$= 1.27465 - 1$

$= 0.2746$

Ans

Q2 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 $u \to 4$

$t \to$ Then $u \to 9$

So the given Question will transform as

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

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

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

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

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

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

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

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