Quiz.

Subject : Calculus

Submitted To : Ma'am Shomaila Mazher

Submitted By : M. Salman

ID : 7759

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Find:

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

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

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

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

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

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

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

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

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

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Hence,

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

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

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

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

Now Diff

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

$= 4t = dy/dt$

$- dt = dy/dt$

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

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

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

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

$= 1/4\ [2y\,|_1^3 + \ln y\,|_1^3] - 1$

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

$$= \frac{1}{4}\left(6 - 2 + 1.0986\right) - 1$$

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

$$= 1.27466 - 1$$

$$= 0.275$$ Answer

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

Solution:

Let $t^2 = y$

Diff w.r.t t^2

$2t = dy/dt$

$dt = dy/2t$

$\because t^2 = y$

$(3)^2 = y$

$9 = y$

Now

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

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

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

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

$= -\cos y \int_4^9$

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

$= -[0.9876 - 0.9776$

$= -(-0.00987)$ Answer.

OR

$-\frac{1}{2}(-0.97+0.65)$

$-\frac{1}{2}(-0.86)$

$= 0.43$ Answer.

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