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SECTION : "A"

SUBJECT : Applied Calculus

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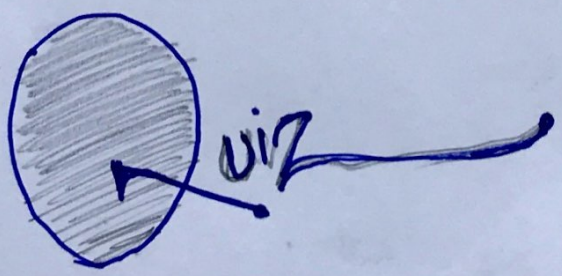

Find: $\int_2^3 t \sin t^2 \, dt$

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

let $t^2 = y$

Diff with respect to "t^2"

$$2t = \frac{dy}{dt}$$

$$dt = \frac{dy}{2t}$$

Now!

As $t \to 3$ Then $y = 9$

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

Sol.

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

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

$$= -\cos y \Big|_4^9$$

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

$$= -[0.9876 - 0.9975]$$

$$= -[-0.0098]$$

$$= 0.00987$$

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

Sol

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

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

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

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

$$= \int_0^1 \frac{t(4t^2+3)}{2t^2+1}\,dt - t\Big|_0^1$$

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

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

NOW! let $2t^2+1=y$

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

As $t \to 0$ i-e $y=1$

$= 2t^2+1=y$

$2t^2=y-1$

Xing both side by 2

$4t^2=2y-2$

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

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

NOW! Diff

$4t=\frac{dy}{dt}$

$dt=\frac{dy}{4t}$

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

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

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

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

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

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

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

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

$$= 1.27465 - 1$$

$$= \boxed{0.2746}$$