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Subject : Calculus

Quiz No. : 1

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

Solution:

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

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

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

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

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

$$I = (1-0)-(1-0)+\frac{1}{4}\left[\ln(2+1) - \ln(1)\right]$$

$$I = \cancel{1} - \cancel{1} + \frac{1}{4}\ln 3 - 0$$

$$\boxed{I = \frac{1}{4}\ln 3}$$

Q.2) $\int_2^3 t \sin t^2 \, dt$

Solution:

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

Put $t^2 = x$

$2t\,dt = dx$

$t\,dt = \frac{1}{2}\,dx$

when $t = 2$

$t^2 = 4$

when $t = 3$

$t^2 = 9$

$$I = \int_4^9 \frac{1}{2} \sin x \, dx$$

$$= \frac{1}{2}(-\cos x)\Big|_4^9$$

$$\boxed{I = -\frac{1}{2}(\cos 9 - \cos 4)}$$

$I = -0.5(0.987 - 0.997)$

$I = -0.5(-0.01)$

$I = 0.005$