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Section = A

Subject = Calculus

Qiza = 1

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Q1) Find

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

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

By partial fraction method

Divide $4t^3-2t^2+3t-1$ by $2t^2+1$

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

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

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

using power rule

$$2\left(\frac{1}{2}t^2\Big]_0^1\right)+\int_0^1 -1\,dt+\int_0^1 \frac{t}{2t^2+1}\,dt$$

Combine $\frac{1}{2}$ & t^2

$$2\left(\frac{t^2}{2}\Big]_0^1\right) + \int_0^1 -1\,dt + \int_0^1 \frac{t}{2t^2+1}\,dt$$

$$2\left(\frac{t^2}{2}\Big]_0^1\right) + (-t)\Big]_0^1 + \int_0^1 \frac{t}{2t^2+1}\,dt$$

Using substitution

let $u = 2t^2+1$ then $du = 4t\,dt$ so

$$\frac{1}{4}\,du = t\,dt$$

$$= 2\left[\frac{t^2}{2}\Big]_0^1\right] + (-t)\Big]_0^1 + \int_1^3 \frac{1}{u} \cdot \frac{1}{4}\,du$$

$$= 2\left(\frac{t}{2}\Big]_0^1\right] + (-t)\Big]_0^1 + \int_1^3 \frac{1}{4u}\,du$$

Applying limit we get

$$\boxed{f(x) = 0.2746}$$

Q2) Find $\int_2^3 t \sin t^2 dt$ ③

Sol:-

let $u = t^2$

$du = 2t\, dt$

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

Replace the value of t & dt

$$= \int_2^3 t \sin u \frac{du}{2t}$$

$$= \int_2^3 \frac{1}{2} \sin u\, du$$

$$= -\frac{1}{2} \cos u \Big|_2^3$$

replace u with t^2

$$= -\frac{1}{2} \cos t^2 \Big|_2^3$$ Applying limits

$$= -\frac{1}{2} \left(\cos (3)^2 - \cos (2)^2\right)$$

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

$$\boxed{= 0.0049}$$ Ans.