

①

$$\int \sin(8x-2) dx$$

$$\text{let } t = 8x-2$$

$$\Rightarrow dt = 8 dx$$

$$\Rightarrow dx = \frac{dt}{8}$$

$$\therefore \int \sin t \times \frac{dt}{8}$$

$$= \frac{1}{8} \int \sin t dt$$

$$= -\frac{1}{8} \cos t + C$$

$$= -\frac{1}{8} \cos(8x-2) + C \quad \underline{\text{Ans}}$$

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②

$$\int_1^4 \frac{(t^2+1)}{\sqrt{t}} dt$$

$$= \int_1^4 \left(\frac{t^2}{\sqrt{t}} + \frac{1}{\sqrt{t}} \right) dt$$

$$= \int_1^4 (t^{3/2} + t^{-1/2}) dt$$

$$= \left[\frac{t^{5/2}}{5/2} \right]_1^4 + \left[\frac{t^{1/2}}{1/2} \right]_1^4$$

$$= \frac{2}{5} [4^{5/2} - 1^{5/2}] + [4^{1/2} - 1^{1/2}] \times 2$$

$$= \frac{2}{5} \times 31 + 2$$

$$= 14.4 \text{ Ans}$$

$$(3) \int x^6 (x^7 - 8)^4 dx$$

$$\text{let } x^7 - 8 = t$$

$$\Rightarrow dt = 7x^6 dx$$

$$\Rightarrow x^6 = \frac{dt}{7}$$

$$\therefore \int x^6 (x^7 - 8)^4 dx$$

$$= \int t^4 \times \frac{dt}{7}$$

$$= \frac{t^5}{5 \times 7} = \frac{(x^7 - 8)^5}{35} + C$$

$$\therefore \int x^6 (x^7 - 8)^4 dx = \frac{(x^7 - 8)^5}{35} + C \quad \underline{\underline{\text{Ans}}}$$

④

$$\begin{aligned} & \int_{-\frac{\pi}{4}}^{\frac{3\pi}{4}} 3 \sec \theta \tan \theta \, d\theta \\ &= 3 \int_{-\frac{\pi}{4}}^{\frac{3\pi}{4}} \sec \theta \tan \theta \, d\theta \\ &= 3 \left[\sec \theta \right]_{-\frac{\pi}{4}}^{\frac{3\pi}{4}} \end{aligned}$$

This integral can not be computed.

⑤

$$\begin{aligned} & \int_0^{\ln 3} e^{3n} \, dn \\ &= \int_0^{\ln 3} e^{3n} \, dn = \frac{1}{3} \left[e^{3n} \right]_0^{\ln 3} \\ &= \frac{1}{3} \left[e^{3 \ln 3} - e^0 \right] \\ &= \frac{1}{3} [27 - 1] = \frac{26}{3} \text{ Ans} \end{aligned}$$

$$\begin{aligned} & \int_0^{\sqrt[3]{10}} n^2 \, dn = \left[\frac{n^3}{3} \right]_0^{(\sqrt[3]{10})^3} \\ &= \frac{1}{3} \left[(\sqrt[3]{10})^3 - 0^3 \right] \\ &= \frac{10}{3} \text{ Ans} \end{aligned}$$

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$$\Rightarrow f(-2) = (-2)^2 - 2 = 2$$

$$f(0) = -2$$

$$f(2) = 2$$

$$f(4) = 16 - 2 = 14$$

$$f(6) = 6^2 - 2 = 36 - 2 = 34$$

∴ Average of the function

$$= \frac{f(-2) + f(0) + f(2) + f(4) + f(6)}{5}$$

$$= \frac{2 - 2 + 2 + 14 + 34}{5}$$

$$= \frac{50}{5} = 10$$

Hence, Average value is 10 Ans.

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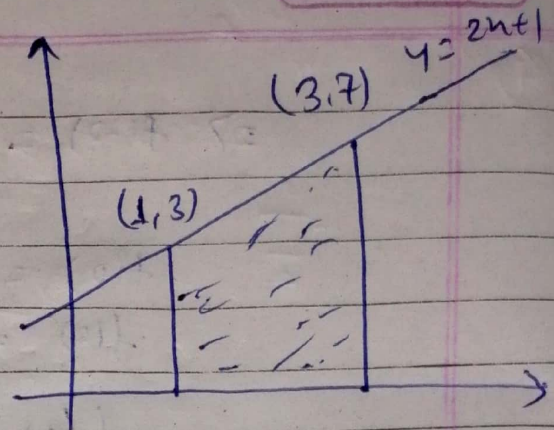
Area of the shaded region

$$= \int_1^3 (2x+1) dx$$

$$= [x^2 + x]_1^3$$

$$= (9+3) - (1+1)$$

$$= 12 - 2 = 10 \text{ sq. Ans}$$

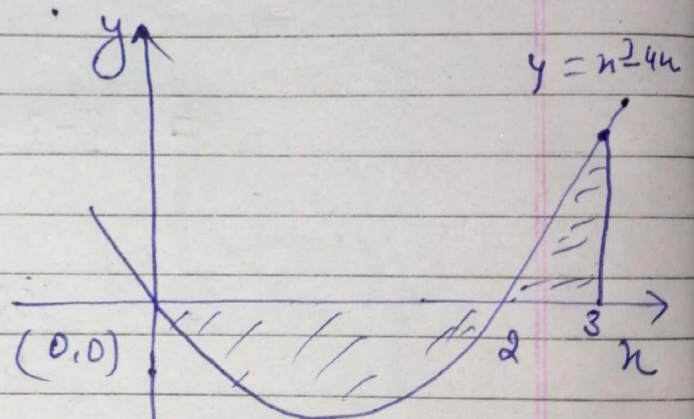


10.

$$y = x^3 - 4x$$

$$= x(x^2 - 4)$$

$$= x(x-2)(x+2)$$



Area of the shaded region

$$= -\int_0^2 (x^3 - 4x) dx + \int_2^3 (x^3 - 4x) dx$$

$$= -\left[\frac{x^4}{4} - 2x^2 \right]_0^2 + \left[\frac{x^4}{4} - 2x^2 \right]_2^3$$

$$= -\left[4 - 8 \right] + \left(\frac{81}{4} - 18 \right) - (4 - 8)$$

$$= 4 + \frac{9}{4} + 4 = \frac{41}{4} \text{ Ans}$$

11.

$$y = \frac{3}{x^3} \quad 1 \leq x \leq 3$$

$$\text{Area} = \int_{x_1}^{x_2} y \, dx$$

$$= \int_1^3 \frac{3}{x^3} \, dx$$

$$= -\frac{3}{2} \left[\frac{1}{x^2} \right]_1^3$$

$$= -\frac{3}{2} \left[\frac{1}{9} - 1 \right] = -\frac{3}{2} \times \frac{-8}{9}$$

$$= \frac{4}{3} \text{ Ans}$$

12.

$$f(x) = 4 - x \quad [0, 4]$$

Average value

$$= \frac{1}{(b-a)} \int_a^b f(x) \, dx$$

$$= \frac{1}{(4-0)} \int_0^4 (4-x) \, dx$$

$$= \frac{1}{4} \left[4x - \frac{x^2}{2} \right]_0^4$$

$$= \frac{1}{4} \times \{ [16 - 2] - [0] \}$$

$$= \frac{1}{4} \times 14 = \frac{7}{2} \text{ Ans}$$

13.

$$\int 6(2x-4)^{-6} dx$$

$$u = 2x - 4$$

$$\Rightarrow du = 2dx$$

$$\Rightarrow dx = \frac{du}{2}$$

$$\therefore \int 6u^{-6} \times \frac{du}{2} = \int 6(2x-4)^{-6} dx$$

$$= 3 \left[\frac{u^{-6+1}}{-6+1} \right]$$

$$= \frac{-3}{5} u^{-5} + C$$

$$= \frac{-3}{545} + \text{Ans}$$

14.
=

$$\int_{\pi/3}^{2\pi} 3 \cos^2 x \sin x \, dx$$

$$\text{let } \cos x = u$$

$$\Rightarrow du = -\sin x \, dx$$

$$\Rightarrow -du = \sin x \, dx$$

$$\therefore \int_{\pi/3}^{2\pi} 3 \times u^2 \times (-du)$$

$$= -3 \int u^2 \, du$$

$$= -3 \frac{u^3}{3} = -1 [\cos^3 x]_{\pi/3}^{2\pi}$$

$$= -1 [\cos^3 2\pi - \cos^3(\pi/3)]$$

$$= -1 [1 - \frac{1^3}{2}] = -\frac{1}{2} = -\frac{4}{8}$$

$$\therefore \int_{\pi/3}^{2\pi} 3 \cos^2 x \sin x \, dx = -\frac{4}{8} \quad \text{Ans}$$