SpeedLabs

MATHS

CBSE 12th

TEEVRA EDUTECH PVT. LTD.

1. $\int_0^{\frac{\pi}{2}} \cos^2 x dx$

Ans. $I = \int_0^{\frac{\pi}{2}} \cos^2 x dx \qquad ......(1)$

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} \cos^2\left(\frac{\pi}{2} - x\right)dx \qquad \left(\int_0^a f(x)dx = \int_0^a (a-x)dx\right)$$

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} \sin^2 x dx \qquad .....(2)$$

Adding (1) and (2) , we obtain

$$2I = \int_0^{\frac{\pi}{2}} (\sin^2 x + \cos^2 x)dx$$

$$\Rightarrow 2I = \int_0^{\frac{\pi}{2}} 1 \cdot dx$$

$$\Rightarrow 2I = [x]_0^{\frac{x}{2}}$$

$$\Rightarrow 2I = \frac{\pi}{2}$$

$$\Rightarrow I = \frac{\pi}{4}$$

2. $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

Ans. $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

$$\text{Let } I = \int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx \qquad ....(1)$$

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin\left(\frac{\pi}{2} - x\right)}}{\sqrt{\sin\left(\frac{\pi}{2} - x\right)} + \sqrt{\cos\left(\frac{\pi}{2} - x\right)}} dx \qquad \left(\int_0^a f(x)dx = \int_0^a f(a-x)dx\right)$$

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} \frac{\sqrt{\cos}}{\sqrt{\cos} + \sqrt{\sin x}} dx \qquad ....(2)$$

Adding (1) and (2), we obtain

$$2I=\int_0^{\frac{\pi}{2}}\frac{\sqrt{\sin x}+\sqrt{\cos x}}{\sqrt{\sin x}+\sqrt{\cos x}}dx$$

$$\Rightarrow 2I=\int_0^{\frac{\pi}{2}} I\cdot dx$$

$$\Rightarrow 2I=[x]_0^{\frac{\pi}{2}}$$

$$\Rightarrow 2I=\frac{\pi}{2}$$

$$\Rightarrow I=\frac{\pi}{4}$$

3. $\int_0^{\frac{\pi}{2}}\frac{\sin^{\frac{3}{2}} x dx}{\sin^{\frac{3}{2}} x+\cos^{\frac{3}{2}} x}$

Ans. Let $I=\int_0^{\frac{\pi}{2}}\frac{\sin^{\frac{3}{2}} x}{\sin^{\frac{3}{2}} x+\cos^{\frac{3}{2}} x}dx$ .....(1)

$$\Rightarrow I=\int_0^{\frac{\pi}{2}}\frac{\sin^{\frac{3}{2}}\left(\frac{\pi}{2}-x\right)}{\sin^{\frac{3}{2}}\left(\frac{\pi}{2}-x\right)+\cos^{\frac{3}{2}} x\left(\frac{\pi}{2}-x\right)}dx \qquad \left(\int_0^a f(x)dx=\int_0^a f(a-x)dx\right)$$

$$\Rightarrow I=\int_0^{\frac{\pi}{2}}\frac{\cos^{\frac{3}{2}}}{\sin^{\frac{3}{2}} x+\cos^{\frac{3}{2}} x}dx \qquad ....(2)$$

Adding (1) and (2), we obtain

$$2I=\int_0^{\frac{\pi}{2}}\frac{\sin^{\frac{3}{2}} x+\cos^{\frac{3}{2}} x}{\sin^{\frac{3}{2}} x+\cos^{\frac{3}{2}} x}dx$$

$$\Rightarrow 2I=\int_0^{\frac{\pi}{2}} 1\cdot dx$$

$$\Rightarrow 2I=[x]_0^{\frac{\pi}{2}}$$

$$\Rightarrow 2I=\frac{\pi}{2}$$

$$\Rightarrow I=\frac{\pi}{4}$$

4. $\int_0^{\frac{\pi}{2}}\frac{\cos^5 x dx}{\sin^5 x+\cos^5 x}$

Ans. Let $I=\int_0^{\frac{\pi}{2}}\frac{\cos^5 x}{\sin^5 x+\cos^5 x}dx$ ....(1)

$$I=\int_0^{\frac{\pi}{2}}\frac{\cos^5 x\left(\frac{\pi}{2}-x\right)}{\sin^5\left(\frac{\pi}{2}-x\right)+\cos^5\left(\frac{\pi}{2}-x\right)}dx \qquad \left(\int_0^a f(x)dx=\int_0^a f(a-x)dx\right)$$

$$\Rightarrow I=\int_0^{\frac{\pi}{2}}\frac{\sin^5 x}{\sin^5 x+\cos^5 x}dx \qquad ....(2)$$

Adding (1) and (2), we obtain

$$2I=\int_0^{\frac{\pi}{2}}\frac{\sin^5 x+\cos^5 x}{\sin^5 x+\cos^5 x}dx$$

$$\Rightarrow 2I=\int_0^{\frac{\pi}{2}}1.dx$$

$$\Rightarrow 2I=[x]_0^{\frac{\pi}{2}}$$

$$\Rightarrow 2I=\frac{\pi}{2}$$

$$\Rightarrow I=\frac{\pi}{4}$$

5. $\int_{-5}^{5}|x+2|dx$

Ans. Let $I=\int_{-5}^{5}|x+2|dx$

It can be seen that (x + 2) 0 on [2, 5] ≤ and (x - 5) ≥ 0 on [5, 8].

$$\therefore I=\int_{-5}^{-2}-(x+2)dx+\int_{-2}^{5}(x+2)dx \qquad \left(\int_a^b f(x)=\int_a^c f(x)+\int_c^b f(x)\right)$$

$$I=-\left[\frac{x^2}{2}+2x\right]_{-5}^{-2}+\left[\frac{x^2}{2}+2x\right]_{-2}^{5}$$

$$=-\left[\frac{(-2)^2}{2}+2(-2)-\frac{(-5)^2}{2}-2(-5)\right]+\left[\frac{(5)^2}{2}+2(5)-\frac{(-2)^2}{2}-2(-2)\right]$$

$$=-\left[2-4-\frac{25}{2}+10\right]+\left[\frac{25}{2}+10-2+4\right]$$

$$=-2+4+\frac{25}{2}-10+\frac{25}{2}+10-2+4$$

$$=29$$

6. $\int_2^8 |x-5| dx$

Ans. Let $I = \int_2^8 |x-5| dx$

It can be seen that (x - 5) ≤ 0 on [2, 5] and (x - 5) ≥ 0 on [5, 8].

$$I = \int_2^5 -(x-5)dx + \int_2^8 (x-5)dx \qquad \left(\int_a^b f(x) = \int_a^c f(x) + \int_c^b f(x)\right)$$

$$= -\left[\frac{x^2}{2} - 5x\right]_2^5 + \left[\frac{x^2}{2} - 5x\right]_5^8$$

$$= -\left[\frac{25}{2} - 25 - 2 + 10\right] + \left[32 - 40 - \frac{25}{2} + 25\right]$$

$$= 9$$

7. $\int_0^1 x(1-x)^n dx$

Ans. Let $I = \int_0^1 x(1-x)^n dx$

$$\therefore I = \int_0^1 (1-x)(1-(1-x))^n dx$$

$$= \int_0^1 (1-x)(x)^n dx$$

$$= \int_0^1 (x^n - x^{n+1}) dx$$

$$= \left[\frac{x^{n+1}}{n+1} - \frac{x^{n+2}}{n+2}\right]_0^1 \qquad \left(\int_0^a f(x)dx = \int_0^a f(a-x)dx\right)$$

$$= \left[\frac{1}{n+1} - \frac{1}{n+2}\right]$$

$$= \frac{(n+2)-(n+1)}{(n+1)(n+2)}$$

$$= \frac{1}{(n+1)(n+2)}$$

8. $\int_0^{\frac{\pi}{4}} \log(1+\tan x)dx$

Ans. Let $I = \int_0^{\frac{\pi}{4}} \log(1+\tan x)dx$ ....(1)

$$\therefore I = \int_0^{\frac{\pi}{4}} \log\left[1+\tan\left(\frac{\pi}{4} - x\right)\right]dx \qquad \left(\int_0^a f(x)dx = \int_0^a (a-x)dx\right)$$

$$\Rightarrow I=\int_0^{\frac{\pi}{4}}\log\left\{1+\frac{\tan\frac{\pi}{4}-\tan x}{1+\tan\frac{\pi}{4}\tan x}\right\}dx$$

$$\Rightarrow I=\int_0^{\frac{\pi}{4}}\log\left\{1+\frac{1-\tan x}{1+\tan}\right\}dx$$

$$\Rightarrow I=\int_0^{\frac{\pi}{4}}\log\frac{2}{(1+\tan x)}dx$$

$$\Rightarrow I=\int_0^{\frac{\pi}{4}}\log 2dx-\int_0^{\frac{\pi}{4}}\log(1+\tan x)dx$$

$$\Rightarrow I=\int_0^{\frac{\pi}{4}}\log 2dx-I \qquad [\text{From(1)}]$$

$$\Rightarrow 2I=[x\log 2]_0^{\frac{\pi}{4}}$$

$$\Rightarrow 2I=\frac{\pi}{4}\log 2$$

$$\Rightarrow I=\frac{\pi}{8}\log 2$$

9. $\int_0^2 x\sqrt{2-x}dx$

Ans. Let $I=\int_0^2 x\sqrt{2-x}dx$

$$I=\int_0^2(2-x)\sqrt{x}dx$$

$$=\int_0^2\left\{2x^{\frac{1}{2}}-x^{\frac{3}{2}}\right\}dx$$

$$=\left[2\left(\frac{x^{\frac{3}{2}}}{\frac{3}{2}}\right)-\frac{x^{\frac{5}{2}}}{\frac{5}{2}}\right]_0^2$$

$$=\left[\frac{4}{3}x^{\frac{3}{2}}-\frac{2}{5}x^{\frac{5}{2}}\right]_0^2$$

$$=\frac{4}{3}(2)^{\frac{3}{2}}-\frac{2}{5}(2)^{\frac{5}{2}}$$

$$=\frac{4\times 2\sqrt{2}}{3}-\frac{2}{5}\times 4\sqrt{2}$$

$$=\frac{8\sqrt{2}}{3}-\frac{8\sqrt{2}}{5}$$

$$=\frac{40\sqrt{2}-24\sqrt{2}}{15}$$

$$=\frac{16\sqrt{2}}{15}$$

10. $\int_0^{\frac{\pi}{2}}\left(2\log\sin x-\log\sin 2x\right)dx$

Ans. Let I= $\int_0^{\frac{\pi}{2}}\left(2\log\sin x-\log\sin 2x\right)dx$

$$\Rightarrow I=\int_0^{\frac{\pi}{2}}\left\{2\log\sin x-\log\left(2\sin x\cos x\right)\right\}dx$$

$$\Rightarrow I=\int_0^{\frac{\pi}{2}}\left\{2\log\sin x-\log\sin x-\log\cos x-\log 2\right\}dx$$

$$\Rightarrow I=\int_0^{\frac{\pi}{2}}\left\{\log\sin x-\log\cos x-\log 2\right\}dx \qquad \text{.....(1)}$$

It is know that, $\left(\int_0^a f(x)dx=\int_0^a f\left(a-x\right)dx\right)$

$$\Rightarrow I=\int_0^{\frac{\pi}{2}}\left\{\log\cos x-\log\sin x-\log 2\right\}dx$$

Adding (1) and (2), we obtain

$$2I=\int_0^{\frac{\pi}{2}}\left(-\log 2-\log 2\right)dx$$

$$\Rightarrow 2I=-2\log 2\int_0^{\frac{\pi}{2}}1\cdot dx$$

$$\Rightarrow I=-\log 2\left[\frac{\pi}{2}\right]$$

$$\Rightarrow I=\frac{\pi}{2}\left(-\log 2\right)$$

$$\Rightarrow I=\frac{\pi}{2}\left[\log\frac{1}{2}\right]$$

$$\Rightarrow I=\frac{\pi}{2}\log\frac{1}{2}$$

11. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}}\sin^2 x dx$

Ans. Let $I = \int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \sin^2 x dx$

As $\sin^2(-x) = (\sin(-x))^2 = (-\sin x)^2, \sin^2 x$, therefore, $\sin^2 x$ is an even function,

It is know that if f (x) is an even function, then $\int_{-0}^{a} f(x) dx = 2\int_{0}^{a} f(x) dx$

$$I = 2\int_{0}^{\frac{\pi}{2}} \sin^2 x dx$$

$$= 2\int_{0}^{\frac{\pi}{2}} \frac{1-\cos 2x}{2} dx$$

$$= \int_{0}^{\frac{\pi}{2}} (1-\cos 2x) dx$$

$$= \left[x - \frac{\sin 2x}{2}\right]_{0}^{\frac{\pi}{2}}$$

$$= \frac{\pi}{2}$$

12. $\int_{0}^{\pi} \frac{xdx}{1+\sin x}$

Ans. Let $I = \int_{0}^{\pi} \frac{xdx}{1+\sin x}$ ......(1)

$$\Rightarrow I = \int_{0}^{\pi} \frac{(\pi - x)}{1+\sin(\pi - x)} dx \qquad \left(\int_{0}^{a} f(x) dx = \int_{0}^{a} f(a-x) dx\right)$$

$$\Rightarrow I = \int_{0}^{\pi} \frac{(\pi - x)}{1+\sin x} dx \qquad .....(2)$$

Adding (1) and (2) , we obtain

$$2I = \int_{0}^{\pi} \frac{\pi}{1+\sin x} dx$$

$$\Rightarrow 2I = \pi\int_{0}^{\pi} \frac{(1-\sin x)}{(1+\sin x)(1-\sin x)} dx$$

$$\Rightarrow 2I = \pi\int_{0}^{\pi} \frac{1-\sin x}{\cos^2 x} dx$$

$$\Rightarrow 2I = \pi\int_{0}^{\pi} \left\{\sec^2 x - \tan x \sec x\right\} dx$$

$$\Rightarrow 2I = \pi\left[\tan x - \sec x\right]_{0}^{\pi}$$

$$\Rightarrow 2I = \pi[2]$$

$$\Rightarrow I = \pi$$

13. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x dx$

Ans. Let $I = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x dx$ ....(1)

As $\sin^7(-x) = (\sin(-x))^7 = (-\sin x)^7 = -\sin^7 x$, therefore, $\sin^2 x$ is an odd function.

It is know that, if f (x) is an odd function then $\int_{-a}^{a} f(x) dx = 0$

$$\therefore I = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x \, dx = 0$$

14. $\int_0^{2\pi} \cos^5 x dx$

Ans. Let $I = \int_0^{2\pi} \cos^5 x dx$ ....(1)

$$\cos^5(2\pi - x) = \cos^5 x$$

It is know that,

$$\int_0^{2a} f(x) dx = 2\int_0^a f(x) dx, \text{ if } f(2a - x) = f(x)$$

$$= 0 \text{ if } f(2a - x) = f(x)$$

$$\therefore I = 2\int_0^{\pi} \cos^5 x dx$$

$$\Rightarrow I = 2(0) = 0 \qquad [\cos^5(\pi - x) = -\cos^5 x]$$

15. $\int_0^{\frac{\pi}{2}} \frac{\sin x - \cos x}{1 + \sin x \cos x} dx$

Ans. Let $I = \int_0^{\frac{\pi}{2}} \frac{\sin x - \cos x}{1 + \sin x \cos x} dx$ ......(1)

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} \frac{\sin\left(\frac{\pi}{2} - x\right) - \cos\left(\frac{\pi}{2} - x\right)}{1 + \sin\left(\frac{\pi}{} - x\right)\cos\left(\frac{\pi}{2} - x\right)} dx \qquad \left(\int_0^a f(x) dx = \int_0^a f(a - x) dx\right)$$

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} \frac{\cos x - \sin x}{1 + \sin x \cos x} dx \qquad ....(2)$$

Adding (1) and (2), we obtain

$$2I = \int_0^{\frac{\pi}{2}} \frac{0}{1+\sin x \cos x} dx$$

$$\Rightarrow I = 0$$

16. $\int_0^{\pi} \log(1+\cos x) dx$

Ans. Let $I = \int_0^{\pi} \log(1+\cos x) dx$ ......(1)

$$\Rightarrow I = \int_0^{\pi} \log(1+\cos(\pi - x)) dx \qquad \left(\int_0^a f(x) dx = \int_0^a f(a-x) dx\right)$$

$$\Rightarrow I = \int_0^{\pi} \log(1-\cos x) dx \qquad .....(2)$$

Adding (1) and (2), we obtain

$$2I = \int_0^{\pi} \{\log(1+\cos x) + \log(1-\cos x)\} dx$$

$$\Rightarrow 2I = \int_0^{\pi} \log(1-\cos^2 x) dx$$

$$\Rightarrow 2I = \int_0^{\pi} \log \sin^2 x dx$$

$$\Rightarrow 2I = 2\int_0^{\pi} \log \sin x dx$$

$$\Rightarrow I = \int_0^{\pi} \log \sin x dx \qquad ....(3)$$

Sin $(\pi - x) = \sin x$

$$\therefore I = 2\int_0^{\frac{\pi}{2}} \log \sin\left(\frac{\pi}{2} - x\right) dx = 2\int_0^{\frac{\pi}{2}} \log \cos x dx \qquad ...(5)$$

Adding (4) and (5), we obtain

$$2I = 2\int_0^{\frac{\pi}{2}} (\log \sin x + \log \cos x) dx$$

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} (\log \sin x + \log \cos x + \log 2 - \log 2) dx$$

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} (\log 2 \sin x \cos x - \log 2) dx$$

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} \log \sin 2x dx - \int_0^{\frac{\pi}{2}} \log 2 dx$$

Let $2x = t$ A $2dx = dt$

When $x = 0, t = 0$ and when $x = \frac{\pi}{2}, \pi =$

$$\therefore I = \frac{1}{2}\int_0^{\pi} \log \sin t\, dt - \frac{\pi}{2} \log 2$$

$$\Rightarrow I = \frac{1}{2}I - \frac{\pi}{2}\log 2$$

$$\Rightarrow \frac{I}{2} = \frac{\pi}{2}\log 2$$

$$\Rightarrow I = -\pi \log 2$$

17. $\int_0^a \frac{\sqrt{x}}{\sqrt{x}+\sqrt{a-x}}dx$

Ans. Let $I = \int_0^a \frac{\sqrt{x}}{\sqrt{x}+\sqrt{a-x}}dx$ ....(1)

It is know that, $\left(\int_0^a f(x)dx = \int_0^a f(a-x)dx\right)$

Adding (1) and (2), we obtain

$$2I = \int_0^a \frac{\sqrt{x}+\sqrt{a-x}}{\sqrt{x}+\sqrt{a-x}}dx$$

$$\Rightarrow 2I = \int_0^a 1 \cdot dx$$

$$\Rightarrow 2I = [x]_0^a$$

$$\Rightarrow 2I = a$$

$$\Rightarrow I = \frac{a}{2}$$

18. $\int_0^4 |x-1|dx$

Ans. $I = \int_0^4 |x-1|dx$

It can be seen that, $(x-1) \le 0$ when $0 \le x \le 1$ and $(x-1) \ge 0$ when $1 \le x \le 4$

$$I = \int_0^1 |x-1|dx + \int_1^4 |x-1|dx \qquad \left(\int_a^b f(x) = \int_a^c f(x) + \int_c^b (x)\right)$$

$$I = \int_0^1 -(x-1)dx + \int_1^4 (x-1)dx$$

$$= \left[x - \frac{x^2}{2}\right]_0^1 + \left[\frac{x^2}{2} - x\right]_1^4$$

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

$=1-\frac{1}{2}+8-4-\frac{1}{2}+1$

$=5$

Show that $\int_0^a f(x)g(x)dx = 2\int_0^a f(x)dx,$ if f and g are defined as $f(x)=f(a-x)$ and $g(x)+g(a-x)=4$

Ans. Let $I=\int_0^a f(x)g(x)dx$ .....(1)

$\Rightarrow I=\int_0^a f(a-x)g(a-x)dx$ $\left(\int_0^a f(x)dx=\int_0^a f(a-x)dx\right)$

$\Rightarrow I=\int_0^a f(x)g(a-x)dx$ .....(2)

Adding (1) and (2), we obtain

$2I=\int_0^a \{f(x)g(x)+f(x)g(a-x)\}dx$

$\Rightarrow 2I=\int_0^a f(x)\{g(x)+g(a-x)\}dx$

$\Rightarrow 2I=\int_0^a f(x)\times 4dx$ $[g(x)+g(a-x)=4]$

$\Rightarrow I=2\int_0^a f(x)dx$

20. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}\left(x^3+x\cos x+\tan^5 x+1\right)dx$ is

(A) 0 (B) 2 (C) π (D) 1

Ans. Let $I=\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}\left(x^3+x\cos x+\tan^5 x+1\right)dx$

$\Rightarrow I=\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}x^3dx+\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}\cos x+\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}\tan^5 xdx+\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}1\cdot dx$

It is know that if f (x) is an even function, then $\int_{-a}^{a} f(x)dx=2\int_0^a f(x)dx$ and if f (x) is and odd function,

Then $\int_{-a}^{a} f(x)dx=0$

$I=0+0+0+2\int_0^{\frac{\pi}{2}}1.dx$

$=2[x]_0^{\frac{\pi}{2}}$

$= \frac{2\pi}{2}$

$= \pi$

Hence the correct answer is c .

21. The value of $\int_0^{\frac{\pi}{2}} \log\left(\frac{4+3\sin x}{4+3\cos x}\right)dx$ is.

(A)2 (B) $\frac{3}{4}$ (C) 0 (D) -2

Ans. Let $I = \int_0^{\frac{\pi}{2}} \log\left(\frac{4+3\sin x}{4+3\cos x}\right)dx$ ....(1)

$$I = \int_0^{\frac{\pi}{2}} \log\left[\frac{4+3\sin\left(\frac{\pi}{2}-x\right)}{4+3\cos\left(\frac{\pi}{2}-x\right)}\right]dx \qquad \left(\int_0^a f(x)dx = \int_0^a f(a-x)dx\right)$$

$$\Rightarrow I = \int_0^{\frac{\pi}{2}} \log\left(\frac{4+3\cos x}{4+3\sin x}\right)dx \qquad ....(2)$$

Adding (1) and (2), we obtain

$$2I = \int_0^{\frac{\pi}{2}} \left\{\log\left(\frac{4+3\sin x}{4+3\cos x}\right) + \log\left(\frac{4+3\cos x}{4+3\sin x}\right)\right\}dx$$

$$\Rightarrow 2I = \int_0^{\frac{\pi}{2}} \log\left(\frac{4+3\sin x}{4+3\cos x} \times \frac{4+3\cos x}{4+3\sin x}\right)dx$$

$$\Rightarrow 2I = \int_0^{\frac{\pi}{2}} \log 1 dx$$

$$\Rightarrow 2I = \int_0^{\frac{\pi}{2}} 0 dx$$

$$\Rightarrow I = 0$$

Hence, the correct answer is c.