CBSE NCERT Based Chapter wise Questions (2025-2026)

Class-XII

Subject: MATHEMATICS

Chapter Name : Integral Calculus (Chap : 7 & 8)

Total : 14 Marks (expected) [MCQ(1)-2 Mark, VSA-(2)-4 Marks, SA-(1)-3 Marks, LA(1)-5 Marks]

Level 1 & 2 Combined

Section - A

MCQ Type :

1. Area bounded by the line y = 4x, the y-axis and the line y = 2 is

Ⓐ 2 sq. units Ⓑ 4 sq. units Ⓒ $\frac{1}{4}$ sq. units Ⓓ $\frac{1}{2}$ sq. units

(Hints : Application of integration)

2. The value of $\int_0^2 x[x]dx$ is ; [ ] → GIF

Ⓐ $\frac{7}{2}$ Ⓑ $\frac{3}{2}$ Ⓒ $\frac{5}{2}$ Ⓓ none of these

(Hints : Definite Integration)

3. If f(a – x) = f(x) then $\int_0^a xf(x)dx$ is equal to

Ⓐ $\int_0^a xf(x)dx$ Ⓑ $a\int_0^a xf(x)dx$ Ⓒ $\frac{a}{2}\int_0^a xf(x)dx$ Ⓓ 0

(Hints : Properties of defenite integration)

4. $\int x^2\sec^2(x^3)dx = a\ \tan(x^3) + c$, then a is equal to

Ⓐ 3 Ⓑ $\frac{1}{2}$ Ⓒ 2 Ⓓ $\frac{1}{3}$

(Hints : Method of substitution)

5. If a is such that $\int_0^a x.dx \le a + 4$ then

Ⓐ $0 \le a \le 4$ Ⓑ $-2 \le a \le 0$ Ⓒ $a \le -2$ or $a \le 4$ Ⓓ $-2 \le a \le 4$

(Hints : Definition of definite integral)

6. If $\int_0^a \frac{dx}{1+4x^2} = \frac{\pi}{8}$, then value of a is equal to

Ⓐ $\frac{1}{3}$ Ⓑ $\frac{1}{2}$ Ⓒ 2 Ⓓ 1

(Hints : using $\int_0^a \frac{dx}{a^2+x^2}$)

7. $\int \frac{\sin\sqrt{x}}{\sqrt{x}}dx$ is equal to

Ⓐ $\cos\sqrt{x} + c$ Ⓑ $2\cos\sqrt{x} + c$ Ⓒ $-2\cos\sqrt{x} + c$ Ⓓ $\sqrt{x}\cos\sqrt{x} + c$

(Hints : Substitution)

8. $\int 2x\sin(x^2+1)dx$ is equal to

Ⓐ $\cos(x^2+1)c$ Ⓑ $2\sin(x^2+1) + c$ Ⓒ $\sin(x^2+1) + c$ Ⓓ $-\cos(x^2+1) + c$

(Hints : Substitution)

9. The area of the region bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$ is

Ⓐ $\frac{3}{8}$ sq. unit Ⓑ $\frac{5}{8}$ sq. unit Ⓒ $\frac{7}{8}$ sq. unit Ⓓ $\frac{9}{8}$ sq. unit

(Hints : Application of integration)

10. The area of the smaller region between the circle. $x^2 + y^2 = 2$ and the line $x + y = \sqrt{2}$ inthe first quadrant is

Ⓐ 1 sq. unit Ⓑ π sq. unit Ⓒ 2π sq. unit Ⓓ $\left(\frac{\pi}{2} - 1\right)$ sq. unit

(Hints : Application of integration)

11. The value of $\int \sqrt{1 + \sin 2x}\ dx$ is

Ⓐ $\sqrt{x + \cos 2x} + c$ Ⓑ $\sin x + \cos x + c$ Ⓒ $\cos x - \sin x + c$ Ⓓ $\sin x - \cos x + c$

(Hints : Standard result)

12. The value of $\int \frac{e^x(1+x)}{\cos^2(x.e^x)}$ is

Ⓐ $\sin(x.e^x) + c$ Ⓑ $\sec^2(x.e^x) + c$ Ⓒ $\tan(x.e^x) + c$ Ⓓ $\cos(xe^x) + c$

(Hints : Method of substitution)

13. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^3 x dx$

Ⓐ $\frac{\pi}{2}$ Ⓑ $\frac{\pi^3}{8}$ Ⓒ $-\frac{\pi}{2}$ Ⓓ 0

(Hints : $\int_{-a}^{a} f(x)dx = 0$ if f is odd)

14. $\int e^x \sin x\ dx = ?$

Ⓐ $\frac{e^x}{2}(\sin x - \cos x) + c$ Ⓑ $\frac{e^x}{2}(\sin x + \cos x) + c$

Ⓒ $\frac{e^x}{2}(\cos x - \sin x) + c$ Ⓓ $\frac{e^x}{2}\sin(x + \tan^{-1} 1) + c$

(Hints : Integration by parts)

Section - B

very short answer (VSA) :

1. If m and n are positive integers and $m \neq n$, show that $\int_0^{2\pi} \sin\ mx\ \sin\ nx dx = 0$

(Hints : Definite integration)

2. If $\frac{d}{dx}f(x) = g(x)$, find the value of $\int_a^b f(x)g(x)dx$

(Hints : Fandamental theorem of Calculus)

3. Prove that $\int_0^{\frac{\pi}{2}} \log(\tan x) dx = 0$

(Hints : Properties of definite integral)

4. Using integration, find the area of the region bounded by the line $2y + x = 8$ and the lines $x = 2$ and $x = 4$.

(Hints : Definite integral as an area)

5. Integrate : $\int \sin^3 x.\cos^3 x dx$

(Hints : Indefinite Integral)

6. Integrate : $\int \cos^5 x.dx$

(Hints : Indefinite Integral)

7. Integrate : $\int x\sin^{-1}x dx$

(Hints : Indefinite Integral)

8. Integrate : $\int \log x dx$

(Hints : Indefinite Integral)

9. Integrate : $\int \frac{dx}{e^x + e^{-x}}$

(Hints : Method of substitution)

10. Integrate : $\int \frac{dx}{2ax - x^2}$

(Hints : Method of substitution)

11. Evaluate : $\int \frac{1 + \cot x}{x + \log \sin x}$

(Hints : Method of substitution)

12. Evaluate : $\int \frac{\tan^4\sqrt{x} \ \sec^2\sqrt{x}}{\sqrt{x}}$

(Hints : Method of substitution)

13. Evaluate : $\int \frac{\sin\left(\tan^{-1}x\right)dx}{1 + x^2}$

(Hints : Method of substitution)

14. Evaluate : $\int \frac{\cos\left(\sqrt{x}\right)}{\sqrt{x}}$

(Hints : Method of substitution)

15. Evaluate : $\int \sec^2(7 - 4x)dx$

(Hints : Method of substitution)

Section - C

short Answer Question (SA) :

1. Evaluate : $\int \sin^4 x \ \ dx$

(Hints : Indefinite Integral)

2. Evaluate : $\int \frac{1 + \cos x}{1 - \cos x} dx$

(Hints : Indefinite Integral)

3. Show that $\int \cos 2x.\cos 4x dx = \frac{\sin 6x}{12} + \frac{\sin 2x}{4} + c$

(Hints : Indefinite Integral)

4. Integrate : $\int \frac{\sin 2x dx}{a^2\sin^2 x + b^2\cos^2 x}$

(Hints : Method of substitution)

5. Integrate : $\int \frac{dx}{\sqrt{x+3} - \sqrt{x+2}}$

(Hints : Method of substitution)

6. Integrate : $\int \frac{dx}{1 + e^x}$

(Hints : Method of substitution)

7. Integrate : $\int \frac{x dx}{x^4 - x^2 + 1}$

(Hints : Method of substitution)

8. Integrate : $\int \frac{(x+2)dx}{2x^2+bx+5}$

(Hints : Method of substitution)

9. Integrate : $\int \frac{x^2dx}{x^2+6x+12}$

(Hints : Method of substitution)

10. Integrate : $\int \frac{dx}{\sqrt{5-4x=2x^2}}$

(Hints : Method of substitution)

11. Integrate : $\int (x+1)^2 \log x \ \ dx$

(Hints : Integration by parts)

12. Integrate : $\int (\sin^{-1}x)^2 \ \ dx$

(Hints : Integration by parts)

13. Integrate : $\int \frac{\sin^{-1}x}{x^2}dx$

(Hints : Integration by parts)

14. Using Integration find the common area between the parabolas $y^2 - ax = a^2$ and $y^2 + ax = a^2$

Section - D

Long Answer Question (LA) :

1. Find the area of the region enclosed between the circles $x^2 + y^2 = 4$ and $(x - 2)^2 + y^2 = 4$

(Hints : Definite integral as an area)

2. Find the area bounded by the curves $y^2 = 4x$ and $x^2 = 4y$.

(Hints : Definite integral as an area)

3. Find the area of the region : $\{(x, y) : y^2 \le 4x, 4x^2 + 4y^2 \le 9\}$

(Hints : Definite integral as an area)

4. Find the area in the first quadrant bounded by the circle $x^2 + y^2 = 16$ and the line $y = x$.

(Hints : Definite integral as an area)

5. Prove that $\int_0^{\pi} \frac{x\sin x dx}{1+\cos^2 x} = \frac{\pi^2}{4}$

(Hints : Definite integral)

6. Prove that $\int_{-a}^{a} \sqrt{\frac{a-x}{a+x}}dx = a\pi$

(Hints : Definite integral)

7. Prove that $\int_0^{\frac{\pi}{2}} \sin 2x \tan^{-1}\left(\sin x\right)dx = \frac{\pi}{2} - 1$

(Hints : Definite integral)

8. If $I_m = \int_1^e (\log x)^m dx$, Show that $I_m + m.\ I_{m-1} < 3$.

(Hints : Definite integral)

9. Integrate : $\int \frac{dx}{x^4+x^2+1}$

(Hints : Indefiinite integral)

10. Integrate : $\int\left(\frac{1}{\log_e^x}-\frac{1}{(\log_e^x)^2}\right)dx$

(Hints : Integration by parts)

11. $\int\frac{xe^x dx}{(x+1)^2}$

(Hints : Integration by parts)

12. $\int e^x\frac{1+\sin x}{1+\cos x}$

(Hints : Integration by parts)

13. $\int\frac{(2x+3)dx}{\sqrt{x^2}+4x+5}$

(Hints : Method of substitution)

14. $\int\frac{(5-2x)dx}{\sqrt{5+4x-x^2}}$

(Hints : Method of substitution)

15. $\int\frac{dx}{x(x^{2026}+1)}$

(Hints : Method of substitution)

16. $\int\tan 2x\ \ \tan 3x\ \ \tan 5x dx$

(Hints : Method of substitution)

17. $\int\frac{dx}{\sqrt{\sin^3 x\ \ \sin(x+a)}}$

(Hints : Method of substitution)

18. $\int\sqrt{\frac{x}{a-x}}dx$

(Hints : Method of substitution)

19. Prove that $\int\frac{\sin^8 x-\cos^8 x}{1-2\sin^2 x.\cos^2 x}dx=-\frac{1}{2}\sin 2x+c$

(Hints : Indefinite Integral)

20. $\int\frac{\cos 5x+\cos 4x}{1-2\cos\ \ 3x}dx=-\left(\frac{1}{2}\sin 2x+\sin x\right)+c$

(Hints : Indefinite Integral)

21. Find the function whose derivative is $2^{2x-1}+2^{1-2x}$

(Hints : Indefinite Integral)

Section - A

1. Ⓓ
2. Ⓑ
3. Ⓒ
4. Ⓓ
5. Ⓓ
6. Ⓑ
7. Ⓒ
8. Ⓓ
9. Ⓓ
10. Ⓓ
11. Ⓓ
12. Ⓒ
13. Ⓓ
14. Ⓐ

Section - B_(VSA)

1. “”Prove that type”.
2. $\frac{1}{2}\left[\left\{f\left(b\right)\right\}^2-\left\{f\left(g\right)\right\}^2\right]$
3. “”Prove that type”.
4. 5 square units
5. $\frac{1}{4}\sin^4x-\frac{1}{6}\sin^6x+c$
6. $\sin x-\frac{2}{3}\sin^3x+\frac{1}{5}\sin^5x+c$
7. $\frac{x^2}{2}\sin^{-1}x+\frac{1}{4}x\sqrt{1-x^2}-\sin^{-1}x+c$
8. $(\log_e^x-1)+c$
9. $\tan^{-1}(e^x)$
10. $\frac{1}{2a}\log\left|\frac{x}{2a-x}\right|+c$
11. $\log|x+\log\sin x|+c$
12. $\frac{2}{5}\tan^5\sqrt{x}+c$
13. $-\cos(\tan^{-1}x)+c$
14. $2\sin\left(\sqrt{x}\right)+c$
15. $-\frac{1}{4}\tan\left(7-4x\right)+c$

Section - C(SA)

1. $\frac{1}{4}\left(\frac{\sin4x}{8}-\sin2x+\frac{3x}{2}\right)+c$
2. $-2\cot\frac{x}{2}-x+c$
3. "Prove that type
4. $\frac{1}{a^2-b^2}\log\left|a^2\sin^2x+b^2\cos^2x\right|+c$

5. $\frac{2}{3}\left[\left(x+3\right)^{\frac{3}{2}}+\left(x+2\right)^{\frac{3}{2}}\right]+c$
6. $-\log\left|1+e^{-x}\right|+c$
7. $\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{2x^2-1}{\sqrt{3}}\right)+c$
8. $\frac{1}{4}\log\left|2x^2+6x+5\right|+\frac{1}{2}\tan^{-1}\left(2x+3\right)+c$
9. $x-3\log\left|x^2+6x+12\right|+2\sqrt{3}\tan^{-1}\left(\frac{x+3}{\sqrt{3}}\right)+c$
10. $\frac{1}{\sqrt{2}}\sin^{-1}\frac{\sqrt{2}\left(x+1\right)}{\sqrt{7}}+c$
11. $\frac{1}{3}\left[\left(x+1\right)^3\log_e^x-\frac{x^3}{3}-\frac{3}{2}x^2-3x-\log_e^x\right]+c$
12. $x\left(\sin^{-1}x\right)^2+2\sqrt{1-x^2}\sin^{-1}x-2x+c$
13. $-\frac{\sin^{-1}x}{x}+\log\left|\frac{1+\sqrt{1-x^2}}{x}\right|+c$
14. $\frac{8}{3}a^2$ square unit

Section -D (LA)

1. $2\left(\frac{4\pi}{3}-\sqrt{3}\right)$ square unit
2. $\frac{16}{3}$square unit unit
3. $\frac{9}{4}\cos^{-1}\frac{1}{3}+\frac{\sqrt{2}}{6}$
4. 2π square units,
5. 5, 6, 7, 8 $\rightarrow$ "Prove that type"
9. $\frac{1}{4}\log\frac{x^2+x+1}{x^2-x+1}+\frac{1}{2\sqrt{3}}\left[\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right)+\tan^{-1}\left(\frac{2x-1}{\sqrt{3}}\right)\right]+c$
10. $\frac{x}{\log_e^x}+c$
11. $\frac{e^x}{x+1}+c$
12. $e^x\tan\frac{x}{2}+c$
13. $2\sqrt{x^2+4x+5}-\log\left|x+2+\sqrt{x^2+4x+5}\right|+c$
14. $2\sqrt{5+4x-x^2}-\log\left|x+2+\sqrt{x^2+4x+5}\right|+c$
15. $\frac{1}{2026}\log\left|\frac{x^{2026}}{x^{2026}+1}\right|+c$
16. $\frac{1}{5}\log|\sec5x|-\frac{1}{3}\log|\sec3x|-\frac{1}{2}\log|\sec2x|+c$
17. $-\frac{1}{x\sin\alpha}\sqrt{\cos\alpha+\sin\alpha.\cot x}+c$
18. $a\ \sin^{-1}\left(\sqrt{\frac{x}{a}}\right)-\sqrt{x(a-x)}+c$
19. "Prove that type"
20. "Prove that type"
21. $\frac{1}{2\log_e^2}\left[2^{2x-1}-2^{1-2x}\right]+c$