



MATHS

BOOKS - NAVBODH MATHS (HINGLISH)

DEFINITE INTEGRALS

Solved Examples

1. Evaluate the following :

$$\int_0^1 \frac{x^2 - 2}{x^2 + 1} dx$$



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2. Evaluate the following :

$$\int_0^{\pi/4} \sin 3x \sin 2x dx$$



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3. Evaluate the following :

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



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4. Evaluate the following integral:

$$\int_1^3 \frac{\cos(\log x)}{x} dx$$



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



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6. Evaluate the following :

$$\int_0^{\pi/2} x \sin x dx$$



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7. Evaluate the following definite integral:

$$\int_1^2 \log x \, dx$$



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8. Evaluate the following :

$$\int_1^2 \frac{dx}{x^2 + 6x + 5}$$



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9. Evaluate the following :

$$\int_0^1 \frac{1}{\sqrt{3 + 2x - x^2}} dx$$



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10. Evaluate: $\int_0^1 \frac{1}{1 + x + \sqrt{x}} dx$



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11. if $\int_0^k \frac{dx}{2 + 8x^2} = \frac{\pi}{16}$ then find the value of k



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12. Evaluate the following :

$$\int_0^{1/2} \frac{dx}{(1 - 2x^2)\sqrt{1 - x^2}}$$



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13. Evaluate the following :

$$\int_0^1 \frac{x^5}{\sqrt{1 - x^2}} dx$$



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14. Evaluate the following :

$$\int_0^{\pi/4} \frac{\sec^2 x}{\tan^2 x + 4 \tan x + 1} dx$$



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15. Evaluate the following :

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



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16. Evaluate the following :

$$\int_0^{\pi} \frac{1}{3 + 2 \sin x + \cos x} dx$$



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17. Evaluate the following :

$$\int_0^{\pi/2} \frac{1}{5 + 4 \sin x} dx$$



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18. Evaluate the following :

$$\int_0^{\pi/2} \frac{1}{a^2 \sin^2 x + b^2 \cos^2 x} dx.$$



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19. Evaluate the following :

$$\int_0^1 x^3 \tan^{-1} x dx$$



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20. Evaluate the following :

$$\int_1^e (\log x) dx$$



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21. Evaluate: $\int_0^1 \frac{x \tan^{-1} x}{(1+x^2)^{3/2}} dx$



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22. Evaluate the following :

$$\int_1^2 \frac{x^2}{x^2 + 4x + 3} dx$$





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23. Evaluate the following :

$$\int_0^{\pi/2} \frac{\cos x}{(4 + \sin x)(3 + \sin x)} dx$$



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24. Evaluate the following :

$$\int_{\pi/2}^{\pi} e^x \left(\frac{1 - \sin x}{1 - \cos x} \right) dx.$$



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25. Evaluate the following :

$$\int_0^9 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{9-x}} dx$$



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26. Evaluate the following :

$$\int_0^{\pi/2} \frac{1}{1 + \sqrt{\tan x}} dx$$



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27. Evaluate the following :

$$\int_0^{\pi/2} \frac{\sqrt[3]{\sec x}}{\sqrt[3]{\sec x} + \sqrt[3]{\operatorname{cosec} x}} dx$$



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28. Evaluate the following :

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



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29. Evaluate the following :

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



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30. Evaluate the following :

$$\int_0^a x^2(a-x)^{\frac{3}{2}} dx.$$



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31. Evaluate the following :

$$\int_0^{\pi} \frac{x \sin x}{1 + \sin x} dx$$



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32. Evaluate: $\int_0^{\frac{\pi}{2}} \frac{\sin^2 x}{\sin x + \cos x} dx$



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33. Evaluate $\int_0^{\frac{\pi}{2}} \log \sin x dx$



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34. Evaluate $\int_{\pi/5}^{3\pi/10} \frac{\sin x}{(\sin x + \cos x)} dx.$



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35. Evaluate the following :

$$\int_1^2 \frac{\sqrt{x}}{\sqrt{3-x} + \sqrt{x}} dx.$$



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36. Evaluate the following :

$$\int_{-\pi/2}^{\pi/2} \log\left(\frac{2 - \sin x}{2 + \sin x}\right) dx$$



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37. Evaluate the following :

$$\int_{-\pi/2}^{\pi/2} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} dx$$



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38. Evaluate the following :

$$\int_{-a}^a \sqrt{\frac{a-x}{a+x}} dx$$



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Examples For Practice

1. Evaluate the following :

$$\int_0^2 \frac{1}{\sqrt{4-x^2}} dx$$



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2. Evaluate the following :

$$\int_0^1 \frac{1 - x^2}{1 + x^2} dx$$



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3. Evaluate : $\int_0^{\pi} \frac{1}{1 + \sin x} dx$



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4. Evaluate the definite integrals $\int_0^{\frac{\pi}{2}} \cos^2 x dx$



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5. Evaluate: $\int_0^{\pi/4} \tan^2 x dx$



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6. Evaluate the following :

$$\int_0^{\pi/2} \sqrt{1 - \cos x} dx$$



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7. Evaluate the following :

$$\int_0^1 \frac{(\sin^{-1} x)^2}{\sqrt{1-x^2}} dx$$



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8. Evaluate the following :

$$\int_0^{\pi/2} \frac{\sin x \cos x}{1 + \sin^4 x} dx$$



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9. Evaluate the following :

$$\int_0^1 \frac{\sqrt{\tan^{-1} x}}{1+x^2} dx.$$



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10. Evaluate the following definite integral:

$$\int_0^{\pi/2} x^2 \cos x dx$$



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11. Evaluate the following :

$$\int_0^{\pi/4} x \sec^2 x dx$$



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12. Evaluate the following :

$$\int_1^3 x^2 \log x dx.$$



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13. Evaluate the following :

$$\int_0^2 \frac{1}{4 + x - x^2} dx$$



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14. Evaluate the following :

$$\int_{-2}^1 \frac{dx}{x^2 + 4x + 13}$$



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15. Evaluate the following definite integral:

$$\int_0^4 \frac{1}{\sqrt{4x - x^2}} dx$$



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16. Evaluate the following :

$$\int_0^4 \frac{1}{\sqrt{x^2 + 2x + 3}} dx$$



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17. Evaluate the following :

$$\int_2^5 \frac{1}{\sqrt{x+4} + \sqrt{x-2}} dx.$$



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18. If $\int_1^a (3x^2 + 2x + 1) dx = 11$ then the value of a is



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19. Evaluate the following : $\int_0^1 x^2 \sqrt{x^3 + 1} dx$





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20. Evaluate the following :

$$\int_0^1 x \cdot \sqrt{\frac{1-x^2}{1+x^2}} dx$$



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21. Evaluate the following integrals:

$$\int_0^1 \sqrt{\frac{1-x}{1+x}} dx$$



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22. Evaluate the following :

$$\int_0^{\pi/2} \frac{\sin^2 x}{(1 + \cos x)^2} dx$$



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23.
$$\int_0^{\pi/4} \frac{\tan^3 x}{(1 + \cos 2x)} dx$$



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24.
$$\int_0^{\pi/4} \tan^4 x dx =$$



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25. Evaluate the following :

$$\int_0^{\pi/4} \sec^4 x dx.$$



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26. Evaluate the following :

$$\int_0^{\pi/6} \frac{dx}{3 - 2 \sin^2 x}$$



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27. Evaluate the following :

$$\int_0^{\pi/4} \frac{dx}{3 + 4 \cos^2 x}$$



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28. Evaluate the following :

$$\int_0^{\pi/4} \frac{dx}{3 \cos 2x + 5}$$



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29. Evaluate the following :

$$\int_0^{\pi/2} \frac{1}{5 + 4 \cos x} dx$$



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30. Evaluate the following :

$$\int_0^{\pi/2} \frac{dx}{3 + 5 \sin x}$$



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31. Evaluate the following :

$$\int_0^{\pi/2} x^2 \sin x dx$$



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32. Evaluate the following :

$$\int_0^1 \tan^{-1} \left(\frac{2x}{1-x^2} \right) dx$$



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33. Evaluate the following :

$$\int_0^1 x \tan^{-1} x dx$$



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34. Evaluate the following :

$$\int_0^1 e^{x^2} \cdot x^3 dx$$



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35. Evaluate the following :

$$\int_0^1 (\cos^{-1} x)^2 dx$$



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36. Evaluate the following :

$$\int_0^{11/\sqrt{2}} \frac{\sin^{-1} x}{(1-x^2)^{3/2}} dx.$$



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37. Evaluate the following :

$$\int_1^2 \frac{x + 3}{(x(x + 2))} dx$$



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38. Evaluate the following :

$$\int_0^{\pi/4} \frac{\sec^2 x}{(1 + \tan x)(2 + \tan x)} dx$$



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39. Evaluate the following :

$$\int_0^{\pi/2} \frac{\sin x \cos x}{(2 \sin x + 1)(\sin x + 1)} dx.$$



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40. Evaluate the following :

$$\int_0^{\pi/4} e^x (1 + \tan x + \tan^2 x) dx$$



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41. Evaluate the following definite integral:

$$\int_1^2 e^{2x} \left(\frac{1}{x} - \frac{1}{2x^2} \right) dx$$



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42.
$$\int_0^{e^2} \left\{ \frac{1}{(\log x)} - \frac{1}{(\log x)^2} \right\} dx$$



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43. Evaluate the following :

$$\int_1^{\pi/2} [\sin(\log x) + \cos(\log x)] dx.$$

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44. Evaluate the following :

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

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45. Evaluate the following :

$$\int_0^{\pi/2} \frac{\sqrt{\tan x}}{\sqrt{\tan x} + \sqrt{\cot x}} dx$$

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46. $\int_0^{\pi/2} \frac{1}{(1 + \sqrt{\cot x})} dx = ?$



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47. Evaluate the following :

$$\int_0^1 \frac{dx}{x + \sqrt{1 - x^2}}.$$



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48. Evaluate the following :

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



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49. Evaluate the following :

$$\int_0^a \frac{\sqrt[n]{x+c}}{\sqrt[n]{x+c} + \sqrt[n]{a+c-x}} dx.$$



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50. Evaluate the following :

$$\int_0^a x^2 \sqrt{1-x} dx$$



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51. Evaluate the following :

$$\int_0^1 x^2(1-x)^{\frac{5}{2}} dx.$$



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52. Evaluate the following integral:

$$\int_0^{\infty} \frac{\log x}{1+x^2} dx$$



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53. Evaluate the following :

$$\int_0^{\pi/2} \sin 2x \cdot \log(\tan x) dx.$$



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54. Evaluate the following :

$$\int_0^{\pi} \frac{x \tan x}{\sec x + \cos x} dx$$



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55. Evaluate the following :

$$\int_0^{\pi} \frac{x \tan x}{\sec x \operatorname{cosec} x} dx$$



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56. Evaluate the following :

$$\int_0^{\pi} x \sin^3 x dx$$



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57. Evaluate $\int_0^{\pi} \frac{x}{(a^2 \cos^2 x + b^2 \sin^2 x)} dx.$



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58. Evaluate the following :

$$\int_{\pi/6}^{\pi/3} \frac{\sqrt[3]{\sin x}}{\sqrt[3]{\sin x} + \sqrt[3]{\cos x}} dx$$

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59. Evaluate the following :

$$\int_{\pi/6}^{\pi/3} \frac{1}{1 + \sqrt{\cot x}} dx$$

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60. Evaluate the following :

$$\int_4^7 \frac{(11-x)^3}{x^3 + (11-x)^3} dx$$



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61. Evaluate the following :

$$\int_1^3 \frac{\sqrt[3]{x+5}}{\sqrt[3]{x+5} + \sqrt[3]{9-x}} dx.$$



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62.

$$\int_0^{\frac{\pi}{2}} \log \sin x dx = \int_0^{\frac{\pi}{2}} \log \cos x dx = \frac{1}{2}(\pi) \log \left(\frac{1}{2} \right)$$



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$$63. \int_0^1 \frac{\log x}{\sqrt{1-x^2}} dx$$



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64. Evaluate the following :

$$\int_{-9}^9 \frac{x^3}{4-x^2} dx$$



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65. Evaluate the following :

$$\int_{-1}^1 \frac{x^2}{1+x^2} dx$$



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66. $\int_{-\pi}^{\pi} \frac{2x(1 + \sin x)}{1 + \cos^2} dx$ is



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14 2 Properties Of Definite Integrals

1. Prove the following properties of definite integrals :

$$\int_0^a f(x) dx = \int_0^a f(a - x) dx$$



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2. $\int_a^b f(x) dx = \int_a^b f(a + b - x) dx.$ Hence
evaluate : $\int_a^b \frac{f(x)}{f(x) + f(a + b - x)} dx.$



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3. Property 6: If $f(x)$ is a continuous function defined on $[0; 2a]$ then

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



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4. $\int_{-a}^a f(x) dx = 2 \int_0^a f(x) dx$, if f is an even function

0, if f is an odd function.



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Multiple Choice Questions

1. If $\int_0^{\infty} 3x^2 dx = -8$, then the value of ∞ is

A. 0

B. -2

C. 2

D. ± 2 .

Answer: B



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2. If $\int_0^{\infty} (3x^2 + 2x + 1) dx = 14$, then

$\infty = \dots\dots\dots$

A. 1

B. 2

C. -1

D. -2

Answer: B



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3. if $\int_0^k \frac{dx}{2 + 8x^2} = \frac{\pi}{16}$ then find the value of k

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. $\frac{1}{5}$.

Answer: A::B



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4. Evaluate : $\int_4^9 \frac{1}{\sqrt{x}} dx$

A. 1

B. -2

C. 2

D. -1

Answer: B



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5. Evaluate : $\int_0^{\pi/2} (a^2 \cos^2 x + b^2 \sin^2 x) dx$

A. $\pi(a + b)$

B. $\frac{\pi}{2}(a + b)$

C. $\frac{\pi}{4}(a + b)$

D. $\frac{\pi}{4}(a - b).$

Answer: A::B::D



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6. $\int_0^{\pi/2} \frac{\sin^2 x dx}{(1 + \cos x)^2} = \dots\dots$

A. $\frac{4 - \pi}{2}$

B. $\frac{\pi - 4}{2}$

C. $4 - \frac{\pi}{2}$

D. $\frac{4 + \pi}{2}$

Answer: B::D



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7. $\int_{-\pi/2}^{\pi/2} \sin|x| dx$

A. -1

B. 0

C. 1

D. 2

Answer: B



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8. $\int_1^2 \frac{\sqrt{x} - \sqrt{3-x}}{1 + \sqrt{x(3-x)}} dx = \dots\dots\dots$

A. -1

B. 0

C. 1

D. $\frac{\pi}{4}$

Answer:



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9. If $I = \int_{-\pi/2}^{\pi/2} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} dx$, then the value of I is

A. 0

B. π

C. $\frac{\pi}{2}$

D. $\frac{\pi}{4}$.

Answer: B



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10. The value of the integral

$$\int_0^{2a} \left[\frac{f(x)}{\{f(x) + f(2a - x)\}} \right] dx \text{ is equal to } a$$

A. 0

B. a

C. 2a

D. $\frac{a}{2}$.

Answer: A



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