



MATHS

BOOKS - BHARATI BHAWAN MATHS (HINGLISH)

Definite Integration

Example

1. Evaluate $\int_0^1 e^{2x} dx$

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2. Evaluate $\int_0^1 x dx$ as the limit of a sum.

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3. Find $\lim_{n \rightarrow \infty} S_n$; if

$$S_n = \frac{1}{2n} + \frac{1}{\sqrt{4n^2 - 1}} + \frac{1}{\sqrt{4n^2 - 4}} + \dots + \frac{1}{\sqrt{3n^2 + 2n - 1}}.$$

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4. Show that $(\lim)_{n \rightarrow \infty} \left(\frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{6n} \right) = \log 6$

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5. $\int_0^1 \log(\sqrt{1-x} + \sqrt{1+x}) dx$ equals:

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6. Prove that $\int_0^{\frac{\pi}{2}} \frac{x dx}{\sin x} = \int_0^1 \frac{\sin^{-1} z}{z\sqrt{1-z^2}} dz.$

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7. Evaluate $\int_0^{\frac{\pi}{2}} \sin x \cdot \log \cos x dx$

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8. $\int_0^{\pi} \frac{dx}{1 - 2a \cos x + a^2}$, $a < 1$ is equal to (A) $\frac{\pi a \log 2}{4}$ (B) $\frac{4\pi}{2 - a^2}$
(C) $\frac{\pi}{1 - a^2}$ (D) none of these

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9. $\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{9 + 16 \sin 2x} dx$

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10. Evaluate $\int \frac{dx}{(x + \sqrt{1 + x^2})^n}$, $n \neq \pm 1$

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11. Evaluate $\int_0^{\frac{\pi}{4}} \sqrt{1 + \tan^2 \theta} d\theta$.

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12. $\int_0^{\frac{\pi}{3}} \frac{x}{1 + \sec x} dx$

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13. Evaluate: $\int_0^1 \cot^{-1}(1 - x + x^2) dx$

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Exercise

1. Integrate from the first principles $\int_0^{\frac{\pi}{2}} \sin x dx$

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

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3. Evaluate $\int_0^1 x^2 dx$ as the limit of a sum.

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4. Integrate: $\int_0^1 2^x dx$

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5. Evaluate the following integrals as limit of sum: $\int_a^b e^x dx$

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6. Integrate $\int_1^2 x^3 dx$

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7. $\lim_{n \rightarrow \infty} \left(\frac{1}{1+n^3} + \frac{4}{8+n^3} + \dots + \frac{r^2}{r^3+n^3} + \dots + \frac{1}{2n} \right)$

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8. Evaluate

$$\lim_{n \rightarrow \infty} \frac{2}{n} \left(\sin. \frac{\pi}{2n} + \sin. \frac{2\pi}{2n} + \sin. \frac{3\pi}{2n} + \dots + \sin. \frac{n\pi}{2n} \right)$$

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9. $\lim_{n \rightarrow \infty} \left(\frac{n}{n^2+1^2} + \frac{n}{n^2+2^2} + \frac{n}{n^2+3^2} + \dots + \frac{1}{2n} \right)$ is equal to

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$$10. \lim_{n \rightarrow \infty} \left[\frac{e^{1/n} + e^{2/n} + e^{3/n} + \dots + e^{n/n}}{n} \right]$$

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11.

$$\lim_{n \rightarrow \infty} \left(\frac{1}{\sqrt{n^2}} + \frac{1}{\sqrt{n^2 - 1^2}} + \frac{1}{\sqrt{n^2 - 2^2}} + \dots + \frac{1}{\sqrt{n^2 - (n-1)^2}} \right)$$

is equal to

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$$12. \lim_{n \rightarrow \infty} \left\{ \frac{1}{n+1} + \frac{1}{n+2} + \frac{1}{n+3} + \dots + \frac{1}{n+n} \right\} \text{ is, equal to}$$

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13. $\lim_{n \rightarrow \infty} \frac{1}{n} \left[\frac{1}{n+1} + \frac{2}{n+2} + \dots + \frac{3n}{4n} \right]$

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14. $\lim_{n \rightarrow \infty} \left[\left(1 + \frac{1}{n}\right) \left(1 + \frac{2}{n}\right) \left(1 + \frac{n}{n}\right) \right]^{\frac{1}{n}}$

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15. $\lim_{n \rightarrow \infty} \left[\left(1 + \frac{1}{n^2}\right) \left(1 + \frac{2^2}{n^2}\right) \left(1 + \frac{3^2}{n^2}\right) \dots \left(1 + \frac{n^2}{n^2}\right) \right]^{\frac{1}{n}}$

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16. Evaluate $\int \cos^5\left(\frac{x}{2}\right) \sin x \, dx$

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

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

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19. Evaluate the following: $\int_0^1 x \log x dx$

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20. Evaluate : $\int_1^{16} \tan^{-1} \sqrt{\sqrt{x} - 1} dx$

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21. Evaluate the following integrals:

$$\int \frac{\cos x}{\cos(x + \alpha)} dx$$

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22. Evaluate the following: $\int_0^1 \frac{x^3 dx}{1 + x^4}$

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23. $\int_0^1 \frac{x dx}{\sqrt{x + \lambda} + \sqrt{x + \mu}}, \lambda \neq \mu$

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24. By using the properties of definite integrals, evaluate the integrals

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

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25. $\int_0^\pi \cos 2x \log \sin x dx =$ (A) π (B) $-\frac{\pi}{2}$ (C) $\frac{\pi}{2}$ (D) none of these

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26. Evaluate the following :

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

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27. integrate $\int_0^{2\pi} e^x \cdot \sin\left(\frac{\pi}{4} + \frac{x}{2}\right) dx$

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28. Evaluate the following: $\int_0^{\frac{\pi}{2}} |\cos x - \sin x| dx$

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29. Evaluate: $\int \sqrt{2ax - x^2} dx$

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30. Evaluate the following integral: $\int_0^a \frac{1}{x + \sqrt{a^2 - x^2}} dx$

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31. Evaluate: $\int_2^3 \frac{2x^5 + x^4 - 2x^3 + 2x^2 + 1}{(x^2 + 1)(x^4 - 1)} dx$

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

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

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

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35. Evaluate: $\int_0^{\pi/4} \frac{\sec x}{1 + 2 \sin^2 x} dx$

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36. Evaluate the following integral: $\int_0^{\pi/2} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x} dx$

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37.
$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sin x + \cos x}{\sqrt{\sin 2x}} dx$$

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38. Evaluate the following:
$$\int_{-\frac{\pi}{4}}^0 \sin x \cdot \sec^2 \left(x + \frac{\pi}{4} \right) dx$$

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39. If $f(x) = x^3$, show that

$$\int_a^b f(x) dx = \frac{b-a}{6} \left\{ f(a) + 4f\left(\frac{a+b}{2}\right) + f(b) \right\}.$$

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40. Find the value of
$$\int_0^{\frac{\pi}{2}} \frac{\sin x \cdot \cos x}{(a^2 \cos^2 x + b^2 \sin^2 x)^2} dx$$

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41. $f(x) = \begin{vmatrix} \sec x & \cos x & \sec^2 x + \cot x \operatorname{cosec} x \\ \cos^2 x & \cos^2 x & \operatorname{cosec}^2 x \\ 1 & \cos^2 x & \cos^2 x \end{vmatrix}$ then

$$\int_0^{\frac{\pi}{2}} f(x) dx = \dots$$

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

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43. The value of $\int_0^{\infty} \frac{54a}{(3 + a + 4y)^4} dy =$

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44. If $\int_0^1 x \ln\left(1 + \frac{x}{2}\right) dx = a + b \cdot \ln\left(\frac{2}{3}\right)$ then $a =$ _____.

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45. The value of $\int_1^{e^{37}} \frac{\pi \sin(\pi \log x)}{x} dx$ is

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46. $\lim_{x \rightarrow \infty} \int_0^x \left\{ \frac{1}{\sqrt{1+t^2}} - \frac{1}{1+t} \right\} dt = \text{-----}$.

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47. $\int_0^{\frac{\pi}{2}} \left\{ \int_{\frac{\pi}{2}}^y \cos x dx \right\} \sin y dy = \text{-----}$.

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48. The value of $\int_1^e \frac{1}{x} (1 + \log x) dx$ is

A. a) 3/2

B. $b)1/2$

C. $c)e$

D. $d)1/e$

Answer:

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49. The value of $\int_0^1 \frac{\sin^{-1} x}{\sqrt{1-x^2}} dx$ is

A. $a)0$

B. $b)3/2$

C. $c)\frac{\pi^2}{72}$

D. $d)none\ of\ these$

Answer:

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

A. a) $\frac{\pi}{2} + 1$

B. b) $\pi + \frac{3}{2}$

C. c) $\pi + 1$

D. d) none of these

Answer:



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51. $\int_{-2}^2 (px^3 + qx + r) dx$, where p, q, r are constant, depends on the value of

A. a) q

B. b) r

C. c)p

D. d)p and q

Answer:

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52. $\lim_{n \rightarrow \infty} \frac{1}{n} \sum_{r=1}^{2n} \frac{r}{\sqrt{n^2 + r^2}}$ equals

A. a) $1 + \sqrt{5}$

B. b) $-1 + \sqrt{5}$

C. c) $-1 + \sqrt{2}$

D. d) $1 + \sqrt{2}$

Answer:

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53. Evaluate $\lim_{n \rightarrow \infty} \frac{1}{n} \sum_{r=n+1}^{2n} \log_e \left(1 + \frac{r}{n} \right)$

A. a) $\log(27/4e)$

B. b) $\log(27/e^2)$

C. c) $\log(4/e)$

D. d) none of these

Answer:

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54. $\frac{1}{c} \int_{ac}^{bc} f\left(\frac{x}{c}\right) dx =$

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55. fill in the blanks. $\int_2^3 \frac{\sqrt{x}}{\sqrt{5-x} + \sqrt{x}} dx = \text{----}$.

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56. In each following ,fill in the blanks so that the resulting sentence become true. If $f(x) = A \cdot 2^x + B$ such that $f'(1) = 2$ and $\int_0^3 f(x)dx = 7$ then the constants A and B are

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57. Evaluate the following integral: $\int_{-1}^1 \log\left(\frac{2-x}{2+x}\right) dx$

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58. If a $f(x)+bf\left(\frac{1}{x}\right) = \frac{1}{x} - 5, x \neq 0, a \neq b$, then $\int_1^2 f(x)dx$ equals

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59. Evaluate the following: $\int_0^{\frac{\pi}{2}} \sin 2x \cdot \tan^{-1}(\cos x) dx$

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60. The value of the integral $\int_{\pi/6}^{\pi/2} \frac{(\sin x - x \cos x)}{x(x + \sin x)} dx$ is equal to

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61. Evaluate the following: $\int_0^{\frac{\pi}{2}} \frac{dx}{1 + 2 \cos^2 x}$

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62. Evaluate the following: $\int_0^{\frac{\pi}{2}} x e^x \sin x dx$

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