



MATHS

BOOKS - NAVBODH MATHS (HINGLISH)

INTEGRATION

Solved Examples

1. If $f'(x) = k(\cos x - \sin x)$, $f'(0) = 3$, $f\left(\frac{\pi}{2}\right) = 15$,

find $f(x)$



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2. Integrate the following w.r.t.x x: $\frac{x + 1}{(x + 2)(x + 3)}$

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3. $\frac{1}{1 - \cos x}$

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4. $\frac{1}{\sin x \cdot \cos^2 x}$

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5. $\sin 7x \cdot \cos 3x$



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6. $\cos^3 x$

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7. Integrate the following w.r.t. x : $\sec^n x \cdot \tan x$

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8. $\frac{1}{x \cdot \log x \cdot \log(\log x)}$

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9. $\frac{\sin \sqrt{x}}{\sqrt{x}}$.

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10. Integrate the following w.r.t.x.:

$$\frac{x^2 \cdot \tan^{-1}(x^3)}{1 + x^6}$$

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11. $\frac{\sec^8 x}{\operatorname{cosec} x}$

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12. $\frac{\sqrt{\tan x}}{\sin x \cdot \cos x}$

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13. $\frac{1}{1 + e^{-x}}$

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14. Integrate the following w.r.t.x.:

$$\frac{\log(x + 2) - \log x}{x(x + 2)}$$

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15.
$$\frac{1}{\sin^4 x + \cos^4 x}$$

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16.
$$\frac{1 + \cos 4x}{\cot x - \tan x}$$

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17.
$$\frac{1}{\sqrt{\sin^3 x \cdot \sin(x + \alpha)}}$$

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18. Integrate the following w.r.t.x:
$$\frac{1}{x^2 \sqrt{a^2 + x^2}}$$



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19. $\sqrt{\frac{a-x}{x}}$



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20. Integrate the following w.r.t.x.

$$\frac{2 \sin x + 3 \cos x}{3 \sin x + 4 \cos x}$$



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21. $\frac{4e^x - 25}{2e^x - 5}$



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22. $\frac{1}{1 - \cot x}$

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23. Integrate the following w.r.t.x.

$$\frac{\sin(x + a)}{\cos(x - b)}$$

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24. Evaluate: $\int \frac{1}{\cos(x - a)\cos(x - b)} dx$

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25. Integrate the following w.r.t.x. $\sin^4 x$



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26. $\tan^5 x$



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27. $\sec^6 x$



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28. Integrate the following w.r.t.x.

$$\frac{1}{x^2 + 4x + 8}$$

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29.
$$\frac{1}{7 + 6x - x^2}$$

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30.
$$\frac{1}{ae^x + be^{-x}}$$

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31. Integrate the following w.r.t.x.

$$\frac{1}{\sqrt{(x-2)(x-3)}}$$

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32. Integrate :- $\frac{1}{\sqrt{15 + 4x - 4x^2}}$

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33. $\frac{1}{x^{\frac{2}{3}} \sqrt{x^{\frac{2}{3}} - 4}}$

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34. Integrate the following w.r.t.x.

$$\frac{1}{x \left[6(\log x)^2 + 7(\log x) + 2 \right]}$$

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35. $\frac{\cos x - \sin x}{\sqrt{8 - \sin 2x}}$

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36. $\frac{\sin x}{\sin 3x}$

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37. Integrate the following w.r.t.x:

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



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38. $\sqrt{\frac{x - 5}{x - 7}}$



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39. Integrate the following w.r.t.x. $\frac{1}{3 + 2 \sin x + \cos x}$,



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40. $\frac{1}{3 + 5 \cos x}$

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41. $\frac{1}{2 - 3 \sin 2x}$

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42. $\frac{1}{1 + \cos \alpha \cdot \cos x}$

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43. Integrate the following w.r.t.x. $x \log x$

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44.
$$\frac{\sec^2 x - 7}{\sin^7 x}$$



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45.
$$\int \frac{x}{1 + \cos 2x} dx$$



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46. Integrate the following w.r.t.x.

$\log x$



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47. $\sin^{-1} x$.

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48. Integrate w.r.t. x , $x^2 e^{3x}$

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49. $\frac{x}{1 + \sin x}$

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50. Integrate the following w.r.t.x.

$$(\log x)^2$$



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51. $\int \log(x + \sqrt{x^2 + a^2}) dx$



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52. Integrate the following w.r.t.x.

$$\frac{x \sin^{-1} x}{\sqrt{1 - x^2}}$$



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53. $\tan^{-1} \sqrt{x}$

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54. integral $(e^{ax} \cos(bx + c))$

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55. $\int \sin(\log x) dx$

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56. $\sec^3 x$.

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57. Show that $\int e^x [f(x) + f'(x)] dx = e^x \cdot f(x) + c$

Hence, evaluate: $\int e^x \left(\frac{2 + \sin 2x}{1 + \cos 2x} \right) dx$

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58. $\frac{x + 3}{(x + 4)^2} e^x dx$ is equal to

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59. $\int e^{\sin^{-1} x} \left[1 + \frac{x}{\sqrt{1 - x^2}} \right] dx$

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60. Evaluate: $\int \frac{\log x}{(1 + \log x)^2} dx$

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61. $\int [\sin(\log x) + \cos(\log x)] dx$

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62. Integrate the following w.r.t.x:

$$\frac{x^2 + 2}{(x - 1)(x + 2)(x + 3)}$$

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63.
$$\frac{2x^3 + 3x^2 - 3}{2x^2 - x - 1}$$



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64. Integrate the following w.r.t.x.

$$\frac{x^2 + 2x + 6}{(x + 1)(x^2 + 4)}$$



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65.
$$\frac{1}{x^3(1 - x)}$$



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66. Integrate the following w.r.t.x. $\frac{x^2}{(x^2 + 2)(2x^2 + 1)}$

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67. $\frac{2x^2 - 1}{(x^2 + 4)(x^2 - 5)}$

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68. Integrate the following w.r.t.x.

$$\frac{3x + 1}{(x - 2)^2(x + 2)}$$

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69.
$$\frac{8}{(x + 2)(x^2 + 4)}.$$



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70. Evaluate the following:

$$\int \frac{1}{x(x^5 + 1)} dx$$



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71.
$$\int \frac{1 + \log x}{x(2 + \log x)(3 + \log x)} dx$$



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$$72. \int \frac{d\theta}{\sin \theta + \sin 2\theta}$$

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Theory Questions

1. if $x = \phi(t)$ and $\int f(x)dx = F(x)$ then
 $\int f(\phi(t))\phi'(t)dt =$ (A) $\phi(x)$ (B) $F(t)$ (C) $F(x)$ (D) $F'(x)$

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$$2. \int \frac{1}{a^2 - x^2} dx = \frac{1}{2} a \log \left(a + \frac{x}{a} - x \right) + c$$

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3. If u and v are two functions of x then prove that:

$$\int uv dx = u \int v dx - \int \left[\frac{du}{dx} \int v dx \right] dx$$

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4.

$$\int \sqrt{a^2 - x^2} dx = \frac{1}{2} x \sqrt{a^2 - x^2} + \frac{1}{2} a^2 \sin^{-1} \left(\frac{x}{a} \right) + c$$

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5.

$$\int \sqrt{a^2 + x^2} = \frac{1}{2} x \sqrt{a^2 + x^2} + \frac{1}{2} a^2 \log \left(x + \sqrt{a^2 + x^2} \right) + c$$

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6.

$$\int \sqrt{x^2 - a^2} = \frac{1}{2}x\sqrt{x^2 - a^2} - \frac{1}{2}a^2 \log(x + \sqrt{x^2 - a^2}) + c$$



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Example For Practice

1. $\frac{1}{x(x-1)}$



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2. $\cos^2 x$



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3. $(\tan x - \cot x)^2$



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4. $\int \frac{1}{1 + \cos 2x}$



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5. $\frac{1}{1 + \sin x}$



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6. $\int \frac{\cos 2x}{\sin^2 x \cos^2 x} dx = ?$



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7. $\sin^3 x$



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8. $\int \frac{\sec^2(\log x)}{x} dx$



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9. $\frac{1}{x(3 + \log x)}$



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$$10. \int \frac{e^{x-1} + x^{e-1}}{e^x + x^e} dx \quad e - dx$$

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$$11. \frac{x \cdot \sin^{-1} x^2}{\sqrt{1 - x^4}}$$

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$$12. \frac{\cos 2x}{(\sin x + \cos x)^2}$$

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$$13. \frac{x^{n-1}}{\sqrt{1 + 4x^n}}$$



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14. Evaluate: $\int \frac{\sec x}{\log(\sec x + \tan x)} dx$

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15. Evaluate: $\int \frac{1}{\sqrt{1-x^2}(2+3\sin^{-1}x)} dx$

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16. समाकलन ज्ञात कीजिए ।

$$\frac{e^{2x} - 1}{e^{2x} + 1}$$

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17. $x^x(1 + \log x)$



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18. $\int \frac{10x^9 + 10x^x(\log)_{e^{10}} dx}{x^{10} + 10^x}$ equals (A) $10^x - x^{10} + C$ (B) $10^x + x^{10} + C$ (C) $(10^x - x^{10})^{-1} + C$ (D) $\log(10^x + x^{10}) + C$



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19. If $f'(x) = 4x^3 - 3x^2 + 2x + k$ and $f(0) = 1, f(1) = 4$ find $f(x)$



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20. Integrate the following w.r.t.x.

$$\frac{\sin 2x}{a \sin^2 x + b \cos^2 x}$$



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21. Evaluate: $\int \frac{1}{\sin^4 x + \cos^4 x} dx$



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22. $\frac{1}{\cos 3x - \cos x}$



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23. $\frac{x^2 + 1}{x^4 + 1}$

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24. $\frac{\sqrt{x^2 - a^2}}{x}$

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25. Evaluate: $\int \frac{x^2}{(a^2 - x^2)^{3/2}} dx$

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26. $\frac{1}{\sqrt{(a^2 + x^2)^3}}$

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$$27. \int \sqrt{\frac{a+x}{a-x}} dx$$

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$$28. \frac{\sin x + 2 \cos x}{3 \sin x + 4 \cos x}$$

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$$29. \frac{1}{2 + 3 \tan x}$$

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30. $\frac{e^{2x} + 2e^x + 1}{e^x}$

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31. $\frac{1}{1 + \tan x}$

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32. $\frac{1}{1 - \cot 2x}$

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33. $\frac{\cos 4x}{\sin 2x}$

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34. $\frac{e^x(1+x)}{\sin(xe^x)}$

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35. $\frac{\cos x}{\cos(x+a)}$

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36. Evaluate : $\int \frac{\sin(x-a)}{\sin(x+a)} dx$

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37. $\frac{\cos(x - a)}{\sin(x + b)}$

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38. Evaluate: $\int \frac{1}{\sin(x - a)\cos(x - b)} dx$

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39. $\int \left(\frac{1}{(\sin x - a)\sin(x - b)} \right) dx$

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40. $\sin^5 x$

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41. $\cos^4 x$

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42. $\cot^3 x$

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43. $\tan^6 x$

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44. $\operatorname{cosec}^6 x$

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45. $\int \frac{dx}{9x^2 + 6x + 10}$

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46. $\frac{1}{1 + x - x^2}$

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47. $\frac{\sin x}{1 + \cos^2 x}$

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$$48. \frac{1}{e^{3x} + e^{-3x}}$$

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$$49. \frac{1}{\sqrt{ax - x^2}}$$

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$$50. \frac{1}{\sqrt{x^2 - 8x - 20}}$$

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$$51. \frac{1}{\sqrt{21 + 4x - x^2}}$$

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$$52. \frac{1}{\sqrt{3 + 4x - 4x^2}}$$

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$$53. \frac{a^x}{\sqrt{1 - a^{2x}}}$$

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$$54. \frac{\sin x}{\sqrt{36 - \cos^2 x}}$$

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55. Integrate the following w.r.t.x.

$$\frac{\sec^2 x}{2 \tan^2 x + 7 \tan x + 13}$$

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56.
$$\frac{\cos x}{\sqrt{\sin^2 x - 2 \sin x - 3}}$$

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57.
$$\frac{1}{1 + 3 \sin^2 x}$$

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$$58. \frac{1}{3 + 2 \cos^2 x}$$

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$$59. \frac{1}{\cos 2x + 3 \sin^2 x}$$

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$$60. \text{Examples: } \frac{1}{1 + 3 \sin^2 x + 8 \cos^2 x} dx$$

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$$61. \frac{\cos x}{\cos 3x}$$



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$$62. \frac{3x + 4}{x^2 + 6x + 5}$$



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$$63. \int \frac{7x + 3}{\sqrt{3 + 2x - x^2}}$$



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$$64. \frac{2x + 1}{\sqrt{x^2 + 2x + 3}}$$



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65. $\frac{\sqrt{9 - x^2}}{x}$

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66. Integrate $\frac{1}{4 + 5 \sin x}$

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67. $\frac{1}{1 - 2 \sin x}$

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68. $\frac{1}{4 - 5 \cos x}$

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69. Evaluate: $\int \frac{1}{13 + 3 \cos x + 4 \sin x} dx$

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70. $\frac{1}{5 + 7 \cos 2x}$

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71. $\frac{1}{3 - 5 \sin 2x}$

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$$72. \frac{1}{3 + 2 \sin 2x + 4 \cos 2x}$$

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$$73. \frac{1}{\cos \alpha + \cos x}$$

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74. Integrate the following w.r.t.x. $x e^x$

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$$75. x \cos x$$





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76. $x \sin 2x$



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77. $\frac{x}{1 - \cos x}$



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78. Integrate the following w.r.t to x :

$x \tan^2 x$



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79. Integrate the function: $x^3 \log x$.



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80. $\tan^{-1} x$



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81. $\cos^{-1} x$



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82. $\sec^{-1} x$



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83. Integrate the following w.r.t.x.

$$x \sin^2 x$$

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84. $x^2 \cos^2 x$

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85. $\frac{x + \sin x}{1 - \cos x}$

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86. $\int x^2 \sin x dx$

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87. $x \sec^{-1} x$

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88. $x \cot^{-1} x$

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89. $x^2 \cos^{-1} x$

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90. $\sin^3 \sqrt{x}$

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91. Integration of $\cos^{-1} x dx$

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92. $\log(x + \sqrt{1 + x^2})$

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93. Integrate the following w.r.t.x.

$$e^x \cdot \cos x$$



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94. $e^{3x} \cdot \sin 4x$



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95. Evaluate: $\int e^{ax} \sin(bx + c) dx$



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96. $\cos(2 \log x)$

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97. $\operatorname{cosec}^3 x$

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98.
$$\int \frac{e^x \left[1 + \sqrt{1 - x^2} \sin^{-1} x \right]}{\sqrt{1 - x^2}} dx$$

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99.
$$e^x \left(\frac{\cos x - \sin x}{\sin^2 x} \right)$$



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100.
$$\int \frac{e^x (1 - \sin x)}{1 - \cos x} dx$$



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101. Evaluate:
$$\int \frac{e^x}{(x + 1)^2} dx$$



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102. Evaluate:
$$\int e^x \frac{x - 1}{(x + 1)^3} dx$$



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103. $\int e^x \cdot \frac{1 + x^2}{(1 + x)^2}$

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104. $\frac{1}{\log x} - \frac{1}{(\log x)^2}$

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

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106. $\int e^{\tan^{-1} x} \left(1 + \frac{x}{1 + x^2} \right) dx$



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107. Integrate the following w.r.t.x.

$$\frac{x + 1}{x^2 + 5x + 6}$$



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108.
$$\frac{1}{x(x - 2)(x - 4)}$$



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109.
$$\frac{x^2 + 1}{x^2 - 5x + 6}$$



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110. Integrate of Following w.r.t x $\frac{x^3 - 4x^2 + 3x + 11}{x^2 - 5x + 6}$

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

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112. $\frac{1 - 3x^2}{x(1 - x^2)}$

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113. $\frac{1}{x^2(1 - 2x)}$

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114. Integrate the following w.r.t.x.

$$\frac{2x^2 - 1}{(x^2 + 5)(x^2 + 4)}$$

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115. $\int \frac{x^2}{x^4 + 5x^2 + 6} dx$

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116.
$$\frac{x^2 + 4}{(x^2 - 8)(5 - x^2)}$$



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117.
$$\int \frac{x^2 + 1}{(x^2 + 2)(x^2 + 4)} dx$$



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118. Integrate the following w.r.t.x.

$$\frac{3x - 2}{(x + 1)^2(x + 2)}$$



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$$119. \frac{x^2 + x + 1}{(x - 1)^3}$$

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$$120. \frac{2x + 7}{(x - 4)^2}$$

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$$121. \frac{x}{(x - 1)(x^2 + 1)}$$

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$$122. \frac{5x^2}{(x + 1)(x^2 + 4)}$$



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$$123. \frac{1}{1 + x + x^2 + x^3}$$



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124. Integrate the following w.r.t.x.

$$\frac{\sin 2x}{(1 - \cos 2x)(2 - \cos 2x)}$$



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$$125. \int \frac{1}{x \cdot \log x \cdot (2 + \log x)}$$



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126. $\int \frac{e^x}{(1 + e^x)(2 + e^x)} dx$

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127. $\int \frac{dx}{\sin x (3 + 2 \cos x)}$

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128. Evaluate: $\int \frac{(3 \sin x - 2) \cos x}{5 - \cos^2 x - 4 \sin x} dx$

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1. Evaluate: (i) $\int \frac{2^x + 3^x}{5^x} dx$ (ii) $\int \frac{(a^x + b^x)^2}{a^x b^x} dx$

A. $\frac{\left(\frac{2}{5}\right)^x}{\log\left(\frac{2}{5}\right)} + \frac{\left(\frac{3}{5}\right)^x}{\log\left(\frac{3}{5}\right)} + c$

B. $\left(\frac{2}{5}\right)^x \log\left(\frac{5}{2}\right) + \left(\frac{3}{5}\right)^x \log\left(\frac{5}{3}\right) + c$

C. $\frac{\left(\frac{2}{5}\right)^x}{\log\left(\frac{5}{2}\right)} + \frac{\left(\frac{3}{5}\right)^x}{\log\left(\frac{5}{3}\right)} + c$

D. $\left(\frac{2}{5}\right)^x \log\left(\frac{2}{5}\right) + \left(\frac{3}{5}\right)^x \log\left(\frac{3}{5}\right) + c$

Answer: A



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2. $\int \frac{\sin 3x}{\sin x} dx = \dots$

A. $x - \sin 2x + c$

B. $x + \sin 2x + c$

C. $x + \cos 2x + c$

D. $x - \cos 2x + c$

Answer: B



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3. Evaluate : $\int \frac{1}{1 + \cos tx} dx$

A. $\tan\left(\frac{x}{2}\right) + c$

B. $2 \tan\left(\frac{x}{2}\right) + c$

C. $-\cot\left(\frac{x}{2}\right) + c$

$$D. -2 \cot\left(\frac{x}{2}\right) + c$$

Answer: A

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$$4. \int \frac{1 + \sin 2x}{\sqrt{x + \sin^2 x}} dx = \dots$$

A. $\sqrt{x + \sin^2 x} + c$

B. $\frac{1}{2} \sqrt{x + \sin^2 x} + c$

C. $2\sqrt{x + \sin^2 x} + c$

D. $\frac{2}{3} (x + \sin^2 x)^{\frac{3}{2}} + c$

Answer: C

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5. Evaluate $\int e^{3 \log x} (x^4 + 1)^{-1} dx$

A. $\log|x^4 + 1| + c$

B. $\frac{1}{2} \log|x^4 + 1| + c$

C. $\frac{1}{4} |x^4 + 1| + c$

D. $\frac{1}{8} \log|x^4 + 1| + c$

Answer: C



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6. $\int \frac{1}{x} \cdot \log x dx = \dots$

A. $\log(\log x) + c$

B. $\frac{1}{2}(\log x)^2 + c$

C. $2\log x + c$

D. $\log x + c$

Answer: B



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7. $\int \frac{\sin x}{(1 - \sin x)} dx = ?$

A. $\sec x - \tan x + c$

B. $\sec x + \tan x - x + c$

C. $\sec - \tan x - x + c$

D. $\sec-\tan x+x+c$

Answer: B

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8. $\int \frac{dx}{x^2(x^4 + 1)^{\frac{3}{4}}}$ is

A. $-\left(1 + \frac{1}{x^4}\right)^{\frac{1}{4}} + c$

B. $\frac{1}{4} \log \left| \frac{x^2}{x^4 + 1} \right| + c$

C. $\frac{1}{2} \log |x^4 + 1| + c$

D. $\left(1 + \frac{1}{x^4}\right)^{\frac{3}{4}} + c$

Answer: A

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9. Write a value of $\int \frac{(\log x)^n}{x} dx$

A. $\frac{1}{n} (\log x)^n + c$

B. $\frac{1}{n+1} (\log x)^{n+1} + c$

C. $\frac{1}{n} (\log x)^{n+1} + c$

D. $\frac{1}{n+1} (\log x)^n + c$

Answer: B



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10.

If $\int \frac{1}{\sqrt{4x^2 - 5}} dx = \alpha \log \left| x + \sqrt{x^2 - \beta} \right|$, then $\alpha + 2\beta$

is

A. -2

B. 2

C. -3

D. 3

Answer: D



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11. If $\int \frac{\log(\log x)}{7x} dx = k \log x [1 - \log(x)] + c$, then $k = \dots$

A. $\frac{1}{7}$

B. 1

C. -1

D. $-\frac{1}{7}$

Answer: D



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12. $\int \frac{1}{4e^x + 9e^{-x}} dx = \dots$

A. $\tan^{-1}\left(\frac{2e^x}{3}\right) + c$

B. $\frac{1}{6}\tan^{-1}\left(\frac{2e^x}{3}\right) + c$

C. $\log|4e^{2x} + 9| + c$

D. $\frac{1}{3}\tan^{-1}\left(\frac{2e^x}{3}\right) + c$

Answer: B



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13. $\int \frac{dx}{(x+1)\sqrt{x}} = \dots$



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14. Q12) If the antiderivative of $f(x)$ is e^x and antiderivative

of $g(x)$ is $\cos x$, then $\int f(x) \cos x dx + \int g(x) e^x dx$

A. $f(x) \cdot g(x) + c$

B. $f(x) + g(x) + c$

C. $-e^x \cos x + c$

D. $e^x \cos x + c$

Answer: D

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15. $\int \left[\frac{1}{\log x} - \frac{1}{(\log x)^2} \right] dx =$

A. $\frac{x}{\log x} + c$

B. $x \cdot \log x + c$

C. $\frac{x}{(\log x)^2} + c$

D. $e^x \cdot \log x + c$

Answer: A



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