Integral Calculus - 1

Miscellaneous Exercise Question Bank | Level - 1

1. $\int \frac{\sin^{-1}\sqrt{x}-\cos^{-1}\sqrt{x}}{\sin^{-1}\sqrt{x}+\cos^{-1}\sqrt{x}}dx$ is:

(A) $\frac{2}{\pi}\left[(2x-1)\sin^{-1}\sqrt{x}+\sqrt{x}\sqrt{1-x}\right]-x+C$ **(B)** $\frac{2}{\pi}\left[(2x-1)\sin^{-1}\sqrt{x}-\sqrt{x}\sqrt{1-x}\right]-x+C$

(C) $\frac{2}{\pi}\left[(2x-1)\sin^{-1}\sqrt{x}+\sqrt{x}\sqrt{1-x}\right]+x+C$ **(D)** $\frac{2}{\pi}\left[(2x-1)\sin^{-1}\sqrt{x}-\sqrt{x}\sqrt{1-x}\right]+x+C$

2. $\int \frac{1}{x^2\left(x^4+1\right)^{3/4}}dx$ is equal to:

(A) $\left(1+\frac{1}{x^4}\right)^{1/4}+C$ **(B)** $\left(x^4+1\right)^{1/4}+C$ **(C)** $\left(1-\frac{1}{x^4}\right)^{1/4}+C$ **(D)** $-\left(1+\frac{1}{x^4}\right)^{1/4}+C$

3. If $\int \frac{4e^x+6e^{-x}}{9e^x-4e^{-x}}dx = Ax+B\log\left(9e^{2x}-4\right)+C$, then :

(A) $A=-\frac{3}{2}, B=\frac{35}{36}, C=0$ **(B)** $A=\frac{35}{36}, B=-\frac{3}{2}, C\in R$

(C) $A=-\frac{3}{2}, B=\frac{35}{36}, C\in R$ **(D)** None of these

4. $\int \frac{x+2}{\left(x^2+3x+3\right)\sqrt{x+1}}dx$ is equal to :

(A) $\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3(x+1)}}\right)$ **(B)** $\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3(x+1)}}\right)$

(C) $\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{x+1}}\right)$ **(D)** None of these

5. If the anti-derivative of $\frac{e^{3x}+e^x}{e^{4x}-e^{2x}+1}$ is $f\left(e^x-e^{-x}\right)+C$ then $f(x)$ is equal to :

(A) $\sin x$ **(B)** $\cos^{-1}x$ **(C)** $\tan^{-1}x$ **(D)** $\tan x$

6. If $\int \frac{(x-1)^2dx}{\left(x^2+1\right)^2} = \tan^{-1}x+g(x)+k$, then $g(x)=$

(A) $\tan^{-1}\left(\frac{x}{2}\right)$ **(B)** $\frac{1}{x^2+1}$ **(C)** $\frac{1}{2\left(x^2+1\right)}$ **(D)** None of these

7. Evaluate : $\int \frac{1-x^7}{x\left(1+x^7\right)}dx$

(A) $\frac{1}{7}\log x^7+\frac{2}{7}\log\left(1+x^7\right)+C$ **(B)** $\frac{1}{7}\log x^7-\frac{2}{7}\log\left(1-x^7\right)+C$

(C) $\frac{1}{7}\log x^7+\frac{2}{7}\log\left(1-x^7\right)+C$ **(D)** $\frac{1}{7}\log x^7-\frac{2}{7}\log\left(1+x^7\right)+C$

8. $\int \frac{x\,dx}{\sqrt{\left(1+x^2\right)+\sqrt{\left(1+x^2\right)^3}}}dx$ is equal to :

(A) $\frac{1}{2}\ell n\left(1+\sqrt{1+x^2}\right)+C$ **(B)** $2\sqrt{1+\sqrt{1+x^2}}+C$

(C) $2\left(1+\sqrt{1+x^2}\right)+C$ **(D)** $4\sqrt{1+\sqrt{1+x^2}}+C$

9. $\int \frac{\left(x+\sqrt{1+x^2}\right)^{2009}}{\sqrt{1+x^2}}dx$ is equal to :

(A) $\frac{2\left(x+\sqrt{1+x^2}\right)^{2009}}{2009}+C$ **(B)** $\frac{\left(x+\sqrt{1+x^2}\right)^{2009}}{2009}+C$

(C) $\frac{\left(\sqrt{1+x^2}\right)^{2009}}{2009}+C$ **(D)** None of these

10. Evaluate $\int \frac{x+2}{\left(x^2+3x+3\right)\sqrt{x+1}}dx$

(A) $\tan^{-1}\left(\frac{x}{\sqrt{3(x+1)}}\right)+C$ **(B)** $\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{x+1}{\sqrt{3(x+1)}}\right)+C$

(C) $\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3(x+1)}}\right)+C$ **(D)** None of these

11. Evaluate $\int \frac{\left(x^2-4\right)}{\left(x^2+1\right)\left(x^2+2\right)\left(x^2+3\right)}dx$

(A) $-\frac{5}{2}\tan^{-1}x+\frac{6}{\sqrt{2}}\tan^{-1}\left(\frac{x}{\sqrt{2}}\right)+C$ **(B)** $\frac{6}{\sqrt{2}}\tan^{-1}\left(\frac{x}{\sqrt{2}}\right)-\frac{7}{2\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3}}\right)+C$

(C) $-\frac{5}{2}\tan^{-1}x-\frac{6}{\sqrt{2}}\tan^{-1}\left(\frac{x}{\sqrt{2}}\right)+\frac{7}{2\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3}}\right)+C$

(D) $-\frac{5}{2}\tan^{-1}x+\frac{6}{\sqrt{2}}\tan^{-1}\left(\frac{x}{\sqrt{2}}\right)-\frac{7}{2\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3}}\right)+C$

12. The value of $\int \frac{\sin 2x+2\tan x}{\cos^6 x+6\cos^2 x+4}dx$ is :

(A) $2\sqrt{\frac{1+\cos^2 x}{\cos^7 x}}$ **(B)** $\tan^{-1}\frac{1}{\sqrt{2}}\left(\frac{1+\cos^2 x}{\cos^7 x}\right)$

(C) $\frac{1}{12}\log\left(1+\frac{6}{\cos^4 x}+\frac{4}{\cos^6 x}\right)$ **(D)** None of these

13. Evaluate: $\int \frac{dx}{\left(2\sin x + 3\cos x\right)^2} = \frac{-1}{2\left(2f\left(x\right)+3\right)} + C$ where $f(x)$ = _____.

(A) $\tan x$ **(B)** $\cos x$ **(C)** $\sin x$ **(D)** $\operatorname{cosec} x$

14. Evaluate: $\int \frac{2+3\cos\theta}{\sin\theta+2\cos\theta+3}d\theta = \frac{P\theta}{5} + \frac{Q}{5}\log\left|\sin\theta+2\cos\theta+3\right| - \frac{R}{5}\tan^{-1}\left(\frac{\tan\theta/2+1}{2}\right) + C$ then $P+Q-R$

(A) 0 **(B)** 1 **(C)** 2 **(D)** 3

15. The value of $\int\left(1+2x+3x^2+4x^3+.....\right)dx$ $\left(\left|x\right|<1\right)$ is:

(A) $\left(1+x\right)^{-1}+c$ **(B)** $\left(1-x\right)^{-1}+c$ **(C)** $\left(1+x\right)^{-2}+c$ **(D)** None of these

16. $\int \sin^2\left(\ell nx\right)dx$ is equal to:

(A) $\frac{x}{10}\left(5+2\sin\left(2\ln x\right)+\cos\left(2\ell nx\right)\right)+c$ **(B)** $\frac{x}{10}\left(5+2\sin\left(2\ln x\right)-\cos\left(2\ell nx\right)\right)+c$

(C) $\frac{x}{10}\left(5-2\sin\left(2\ln x\right)-\cos\left(2\ell nx\right)\right)+c$ **(D)** $\frac{x}{10}\left(5-2\sin\left(2\ln x\right)+\cos\left(2\ell nx\right)\right)+c$

17. $\int \frac{\sin 2x}{\sin^4 x + \cos^4 x}\,dx$

18. $\int \frac{x-\sin x}{1-\cos x}\,dx$

19. $\int \frac{\log x}{x^3}\,dx$

20. $\int \frac{1}{(x+2)\sqrt{x-1}}\,dx$

21. $\int \frac{1}{x^2 - 2x\cos\theta + 1}\,dx$

22. $\int \frac{1}{1+3e^x+2e^{2x}}\,dx$

23. $\int \sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}}\,dx$

24. $\int \frac{1}{x+\sqrt{x+1}}\,dx$

25. $\int \frac{1}{\sin x + \sec x}\,dx$

26. $\int \frac{(\cos x - \sin x)}{7 - 9\sin 2x}\,dx$

27. $\int \frac{\tan x}{\sqrt{\sin^4 x + \cos^4 x}}\,dx$ is equal to:

(A) $\log\left(\tan^2 x + \sqrt{1+\tan^4 x}\right)+C$ **(B)** $\frac{1}{2}\log\left(\tan^2 x + \sqrt{1+\tan^4 x}\right)+C$

(C) $\frac{1}{4}\log\left(\tan^2 x + \sqrt{1+\tan^4 x}\right)+C$ **(D)** None of these

28. $\int \frac{e^{\tan^{-1}x}}{(1+x^2)}(1+x+x^2)\,dx$ is equal to:

(A) $\frac{e^{\tan^{-1}x}}{1+x^2}$ **(B)** $e^{\tan^{-1}x}.(1+x^2)$ **(C)** $xe^{\tan^{-1}x}$ **(D)** None of these

29. If $\int x \log\left(1+\frac{1}{x}\right)dx = f(x)\log(x+1) + g(x)\log x^2 + Lx + c$, then:

(A) $f(x) = \frac{x^2}{2}$ **(B)** g (x) = log x **(C)** L = 1 **(D)** $L = \frac{1}{2}$

30. $\int \frac{x^{1/2}}{x^{1/2}-x^{1/3}}\,dx$ is equal to :

(A) $6\left[\frac{x}{6}+\frac{x^{\frac{5}{6}}}{5}+\frac{x^{\frac{2}{3}}}{4}+\frac{x^{\frac{1}{2}}}{3}+\frac{x^{\frac{1}{3}}}{2}+x^{\frac{1}{6}}+\log\left(x^{\frac{1}{6}}-1\right)\right]+C$

(B) $6\left[\frac{x}{6}-\frac{x^{\frac{5}{6}}}{5}+\frac{x^{\frac{2}{3}}}{4}-\frac{x^{\frac{1}{2}}}{3}+\frac{x^{\frac{1}{3}}}{2}+x^{\frac{1}{6}}-\log\left(x^{\frac{1}{6}}-1\right)\right]+C$

(C) $6\left[\frac{x}{6}+\frac{x^{\frac{5}{6}}}{5}-\frac{x^{\frac{2}{3}}}{4}+\frac{x^{\frac{1}{2}}}{3}-\frac{x^{\frac{1}{3}}}{2}+x^{\frac{1}{6}}-\log\left(x^{\frac{1}{6}}-1\right)\right]+C$

(D) None of these

31. The antiderivative of the function $(3x + 4)\,|\sin x\,|$, when $0 < x < \pi$, is given by:

(A) $3\sin x - (3x+4)\cos x$ **(B)** $3\sin x + (3x+4)\cos x$

(C) $-3\sin x + (3x+4)\cos x$ **(D)** None of these

32. If $\int u\,v''\,dx = uv' - vu' + a$, then a is :

(A) $\int u''.v\,dx$ **(B)** $\int u'.v\,dx$ **(C)** $\int uv'\,dx$ **(D)** None of these

33. If $\int \frac{dx}{\sqrt{2ax-x^2}} = (f\,o\,g)(x) + C$, then:

(A) $f(x) = \sin^{-1}x, g(x) = \frac{x+a}{a}$ **(B)** $f(x) = \sin^{-1}x, g(x) = \frac{x+a}{a}$

(C) $f(x) = \cos^{-1}x, g(x) = \frac{x-a}{a}$ **(D)** $f(x) = \tan^{-1}x, g(x) = \frac{x-a}{a}$

34. $\int\left[\sin(\log x) + \cos(\log x)\right]dx$ is equal to :

(A) sin (log x) + cos (log x) + C **(B)** x sin (log x) + C

(C) x cos (log x) + C **(D)** None of these

35. $\int \frac{dx}{x^3-1}$

36. $\int \frac{3x+5}{x^3-x^2-x+1}\,dx$

37. $\int \frac{x}{(1+x)(1+x^2)}\,dx$

38. $\int \frac{x-1}{(x+1)(x^2+1)}\,dx$

39. $\int \frac{dx}{(x-1)(x^2+1)}$

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

41. $\int \frac{x}{(x^2-a^2)(x^2-b^2)}\,dx$

42. $\int \frac{x^2+1}{(x^2+2)(2x^2+1)}\,dx$

43. $\int \frac{1+x+x^2}{x^3(1+x)}\,dx$

44. $\int \frac{x}{(x-3)\sqrt{x+1}}\,dx$

45. $\int \frac{2-3x}{x\sqrt{1+x}}\,dx$

46. $\int \frac{x^2+2}{(x^2+2x+2)\sqrt{x-1}}\,dx$

47. $\int \frac{dx}{(x+1)^{3/2}(x-1)^{1/2}}$

48. $\int \frac{x^2+2x+3}{(x+1)\sqrt{x^2+1}}\,dx$

49. $\int \frac{dx}{(1+x)^2\sqrt{2+x^2}}$

50. $\int \frac{x}{(x^2+4)\sqrt{x^2+9}}\,dx$

51. $\int \frac{\sqrt{1+x^2}}{x}\,dx$

52. $\int \frac{x^2}{(4+x^2)^{3/2}}\,dx$

53. $\int x\sqrt{\frac{1-x^2}{1+x^2}}\,dx$

54. $\int \frac{1+x^{1/2}}{1+x^{1/3}}\,dx$

55. $\int \frac{\sqrt{x}}{(1+x)(2+x)(3+x)}\,dx$

56. $\int \cos^n x\,dx$

57. $\int \cot^n x\,dx$

58. $\int \operatorname{cosec}^n x\,dx$

***59.** If $\int \frac{xe^x}{\sqrt{1+e^x}}dx = f(x)\sqrt{1+e^x} - 2\log g(x) + C$, then:

(A) $f(x) = x - 1$ **(B)** $g(x) = \frac{\sqrt{1+e^x}-1}{\sqrt{1+e^x}+1}$

(C) $g(x) = \frac{\sqrt{1+e^x}+1}{\sqrt{1+e^x}-1}$ **(D)** $f(x) = 2(x-2)$

60. $\int \frac{1}{\sin x\,(5+4\cos x)}\,dx$

61. $\int \frac{3x+5}{x^3-x^2-x+1}\,dx$

62. $\int \frac{3+4\sin x+2\cos x}{3+2\sin x+\cos x}\,dx$

63. $\int \frac{e^{2x}}{(e^x+1)^{1/4}}\,dx$

***64.** If $\int \frac{e^{4x}-1}{e^{2x}}\log\left(\frac{e^{2x}+1}{e^{2x}-1}\right)dx = \frac{t^2}{2}\log t - \frac{t^2}{4} - \frac{u^2}{2}\log u + \frac{u^2}{4} + C$, then :

(A) $u = e^x + e^{-x}$ **(B)** $u = e^x - e^{-x}$ **(C)** $t = e^x + e^{-x}$ **(D)** $t = e^x - e^{-x}$

65. $\int \frac{x^3+x^2+x+2}{x^4+3x^2+2}\,dx$

66. $\int \frac{x^4-2x^3+3x^2-x+3}{x^3-2x^2+3x}\,dx$

67. $\int \frac{x}{\sec x+1}\,dx$

68. $\int \frac{1}{\log x^x\,[(\log x)^2 - 3\log x - 10]}\,dx$

69. $\int \frac{\sin x}{\sin 4x}\,dx$

70. $\int \frac{dx}{\sqrt[4]{(x-1)^3\,(x+2)^5}}$ is equal to :

(A) $\frac{4}{3}\sqrt[4]{\frac{x-2}{x+1}} + C$ **(B)** $\frac{4}{3}\sqrt[4]{\frac{x-1}{x+2}} + C$ **(C)** $\frac{4}{3}\sqrt[4]{\frac{x+2}{x-1}} + C$ **(D)** None of these

71. If $f\left(\frac{3x-4}{3x+4}\right) = x + 2$, then $\int f(x)\,dx$ is equal to:

(A) $e^{x-2} \ln\left|\frac{3x-4}{3x+4}\right| + c$ **(B)** $-\frac{8}{3}\ln|x-1| + \frac{2}{3}x + c$

(C) $\frac{8}{3}\ln|x-1| + \frac{x}{3} + c$ **(D)** None of these

72. $\int \frac{x + \sqrt[3]{x^2} + \sqrt[6]{x}}{x\left(1+\sqrt[3]{x}\right)}\,dx$ is equal to :

(A) $\frac{3}{2}x^{2/3} + 6\tan^{-1}x^{1/6} + C$ **(B)** $\frac{3}{2}x^{2/3} - 6\tan^{-1}x^{1/6} + C$

(C) $\frac{-3}{2}x^{2/3} + 6\tan^{-1}x^{1/6} + C$ **(D)** None of these

73. $\int \frac{dx}{x(x^n+1)}$ is equal to :

(A) $\frac{1}{n}\log\left(\frac{x^n}{x^n+1}\right) + C$ **(B)** $\frac{1}{n}\log\left(\frac{x^n+1}{x^n}\right) + C$

(C) $\log\left(\frac{x^n}{x^n+1}\right) + C$ **(D)** None of these

74. If $I_n = \int \tan^n x\,dx$, then $I_0 + I_1 + 2(I_2 + \ldots + I_8) + I_9 + I_{10}$ is equal to :

(A) $\left(\frac{\tan x}{1} + \frac{\tan^2 x}{2} + \ldots + \frac{\tan^9 x}{9}\right)$ **(B)** $-\left(\frac{\tan x}{1} + \frac{\tan^2 x}{2} + \ldots + \frac{\tan^9 x}{9}\right)$

(C) $\left(\frac{\cot x}{1} + \frac{\cot^2 x}{2} + \ldots + \frac{\cot^9 x}{9}\right)$ **(D)** None of these

75. If $\int \frac{\left(x - x^3\right)^{1/3}}{x^4}\,dx = a\left(\frac{1}{x^2} - 1\right)^b + c$, then the value of $\frac{1}{|ab|}$ is:

(A) 1 **(B)** 2 **(C)** 3 **(D)** 4

Integral Calculus - 1

Miscellaneous Exercise Question Bank | Level - 2

76. $\int \sin x \cdot \cos x \cdot \cos 2x \cdot \cos 4x \cdot \cos 8x \cdot \cos 16x \, dx$ equals:

(A) $\frac{\sin 16x}{1024} + c$ **(B)** $-\frac{\cos 32x}{1024} + c$ **(C)** $\frac{\sin 32x}{1096} + c$ **(D)** $-\frac{\sin 32x}{1096} + c$

77. If $\int \frac{dx}{(x+2)(x^2+1)} = a\ell n\left(1+x^2\right) + b\tan^{-1}x + \frac{1}{5}\ell n\left|x+2\right| + C$ then:

(A) $a = -\frac{1}{10}, b = -\frac{2}{5}$ **(B)** $a = \frac{1}{10}, b = -\frac{2}{5}$

(C) $a = -\frac{1}{10}, b = \frac{2}{5}$ **(D)** $a = \frac{1}{10}, b = \frac{2}{5}$

78. $\int \frac{x^4 - 4}{x^2\sqrt{4 + x^2 + x^4}} dx$ equals :

(A) $\frac{\sqrt{4 + x^2 + x^4}}{x} + c$ **(B)** $\sqrt{4 + x^2 + x^4} + c$

(C) $\frac{\sqrt{4 + x^2 + x^4}}{2} + c$ **(D)** $\frac{\sqrt{4 + x^2 + x^4}}{2x} + c$

79. $\int \frac{\sin x + 4\sin 3x + 6\sin 5x + 3\sin 7x}{\sin 2x + 3\sin 4x + 3\sin 6x} dx$ equals :

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

80. $\int e^{\tan^{-1}x}\left(1 + x + x^2\right) . d\left(\cot^{-1}x\right)$ is equal to :

(A) $-e^{\tan^{-1}x} + c$ **(B)** $e^{\tan^{-1}x} + c$ **(C)** $-x \, . \, e^{\tan^{-1}x} + c$ **(D)** $x \, . \, e^{\tan^{-1}x} + c$

81. $\int e^{x^4}\left(x + x^3 + 2x^5\right)e^{x^2} dx$ is equal to :

(A) $\frac{1}{2}xe^{x^2} . e^{x^4} + c$ **(B)** $\frac{1}{2}x^2 . e^{x^4} + c$ **(C)** $\frac{1}{2}e^{x^2} . e^{x^4} + c$ **(D)** $\frac{1}{2}x^2e^{x^2} . e^{x^4} + c$

82. $\int \frac{dx}{x^4\left[x\left(x^5 - 1\right)\right]^{1/3}}$ equals:

(A) $\frac{3}{2}\left\{\frac{x^5 - 1}{x^5}\right\}^{2/3} + c$ **(B)** $\frac{3}{10}\left\{\frac{x^5 - 1}{x^5}\right\}^{2/3} + c$ **(C)** $\frac{3}{4}\left\{\frac{x^5 - 1}{x^5}\right\}^{2/3} + c$ **(D)** $\frac{3}{5}\left\{\frac{x^5 - 1}{x^5}\right\}^{2/3} + c$

83. The value of integral $\int \frac{d\theta}{\cos^3\theta\sqrt{\sin 2\theta}}$ can be expressed as irrational function of $\tan\theta$ as :

(A) $\frac{\sqrt{2}}{5}\left(\sqrt{\tan^2\theta + 5}\right)\tan\theta + c$ **(B)** $\frac{2}{5}\left(\tan^2\theta + 5\right)\sqrt{\tan\theta} + c$

(C) $\frac{\sqrt{2}}{5}\left(\tan^2\theta + 5\right)\sqrt{\tan\theta} + c$ **(D)** $\sqrt{\frac{2}{5}}\left(\tan^2\theta + 5\right)\sqrt{\tan\theta} + c$

84. $\int \frac{\ell n\left(\cos x+\sqrt{\cos 2x}\right)}{\sin^2 x}dx$

(A) $\frac{\sqrt{\cos 2x}}{\sin x}-x-\cot x-\cot x\,\ell n\left(e\left(\cos x+\sqrt{\cos 2x}\right)\right)+C$

(B) $x-\cot x-\cot x\,\ell n\left(e\left(\cos x+\sqrt{\cos 2x}\right)\right)+C$

(C) $\frac{\sqrt{\cos 2x}}{\sin x}-x-\cot x-\cot x\,\ell n\left(\cos x+\sqrt{\cos 2x}\right)+C$

(D) None of these

85. Let $f(x)$ is a quadratic function such that $f(0)=1$ and $\int \frac{f(x)dx}{x^2(x+1)^3}$ is a rational function, find the value of $f'(0)$.

(A) 1 **(B)** 0 **(C)** 2 **(D)** 3

86. $\int \frac{\sec x\cdot \operatorname{cosec} x}{2\cot x-\sec x\operatorname{cosec} x}dx$ is equal to :

(A) $\frac{1}{2}\ln|\sec 2x+\tan 2x|+C$ **(B)** $\ln|\sec x+\operatorname{cosec} x|+C$

(C) $\ln|\sec x+\tan x|+C$ **(D)** $\frac{1}{2}\ln|\sec x+\operatorname{cosec} x|+C$

87. $\int \frac{1}{x}\ln\left(\frac{x}{e^x}\right)dx=$

(A) $\frac{1}{2}e^x-\ln x+C$ **(B)** $\frac{1}{2}\ln x-e^x+C$ **(C)** $\frac{1}{2}(\ln x)^2-x+C$ **(D)** $\frac{e^x}{2x}+C$

88. If $\int x^{26}\cdot(x-1)^{17}\cdot(5x-3)dx=\frac{x^{27}\cdot(x-1)^{18}}{k}+C$ where C is a constant of integration, then the value of k is equal to :

(A) 3 **(B)** 6 **(C)** 9 **(D)** 12

89. If $\int \frac{x+(\cos^{-1}3x)^2}{\sqrt{1-9x^2}}dx=A\sqrt{1-9x^2}+B(\cos^{-1}3x)^3+C$, then $A-B$ is :

(A) $\frac{2}{9}$ **(B)** $-\frac{1}{9}$ **(C)** $\frac{1}{9}$ **(D)** 0

90. If $\int \tan^9 x\,dx=f(x)+\log|\cos x|$, where $f(x)$ is a polynomial of degree n in $\tan x$, then the value of n is:

(A) 6 **(B)** 7 **(C)** 8 **(D)** None of these

91. $\int \frac{\cos x-\sin x+1-x}{e^x+\sin x+x}dx=\log_e(f(x))+g(x)+C$ where C is the constant of integration and $f(x)$ is positive. Then $f(x)+g(x)$ has the value equal to :

(A) $e^x+\sin x+2x$ **(B)** $e^x+\sin x$ **(C)** $e^x-\sin x$ **(D)** $e^x+\sin x+x$

92. $\int \frac{x + x^{2/3} + x^{1/6}}{x(1 + x^{1/3})} dx$ equal :

(A) $\frac{3x^{2/3}}{4} + 6\tan^{-1}(x^{1/6}) + C$ **(B)** $\frac{3x^{2/3}}{2} + 6\tan^{-1}(x^{1/6}) + C$

(C) $\frac{3x^{2/3}}{10} + 6\tan^{-1}(x^{1/6}) + C$ **(D)** $\frac{3x^{2/3}}{5} + 6\tan^{-1}(x^{1/6}) + C$

93. $\int \frac{e^x(x-2)}{x(x^2+e^x)} dx \ \forall \ x > 0$ is equal to :

(A) $\ln\left(1 + \frac{e^x}{x^2}\right) + c$ **(B)** $\ln\left(-\frac{1}{2} + \frac{e^x}{x^2}\right) + c$

(C) $\ln\left(2 + \frac{e^x}{x^2}\right) + c$ **(D)** $\ln\left(x + \frac{e^x}{x^2}\right) + c$

94. The value of $\int \frac{\text{cosec}\, x}{\cos^2\left(1 + \log\tan\frac{x}{2}\right)} dx$ is :

(A) $-\tan\left(1 + \log\tan\frac{x}{2}\right) + c$ **(B)** $\sec^2\left(1 + \log\tan\frac{x}{2}\right) + c$

(C) $\tan\left(1 + \log\tan\frac{x}{2}\right) + c$ **(D)** $\sin^2\left(1 + \log\tan\frac{x}{2}\right) + c$

95. $\int \frac{dx}{x\sqrt{x^6 - 16}} =$

(A) $\sec\frac{x^3}{4} + c$ **(B)** $\frac{1}{12}\sec\frac{x^3}{4} + c$ **(C)** $\frac{1}{3}\sec\frac{x^3}{4} + c$ **(D)** None of these

96. $\int \frac{dx}{\cos(2x)\cos(4x)} =$

(A) $\frac{1}{2\sqrt{2}}\log\left|\frac{1 + \sqrt{2}\sin 2x}{1 - \sqrt{2}\sin 2x}\right| + \frac{1}{2}(\log|\sec 2x - \tan 2x|) + C$

(B) $\frac{1}{2\sqrt{2}}\log\left|\frac{1 - \sqrt{2}\sin 2x}{1 + \sqrt{2}\sin x}\right| - \frac{1}{2}(\log|\sec 2x - \tan 2x|) + C$

(C) $\frac{1}{\sqrt{2}}\log\left|\frac{1 + \sqrt{2}\sin 2x}{1 - \sqrt{2}\sin x}\right| - \frac{1}{2}(\log|\sec 2x - \tan 2x|) + C$

(D) None of these

97. $\int x\, 2^{\ln(x^2+1)} dx$ is equal to :

(A) $\frac{2^{\ln(x^2+1)}}{2(x^2+1)} + C$ **(B)** $\frac{(x^2+1)2^{\ln(x^2+1)}}{\ln 2 + 1} + C$

(C) $\frac{(x^2+1)^{\ln 2 + 1}}{2(\ln 2 + 1)} + C$ **(D)** $\frac{(x^2+1)^{\ln 2}}{2(\ln 2 + 1)} + C$

98. If $\int \frac{\sin x}{\sin\left(x-\frac{\pi}{4}\right)}dx = Af(x)+\frac{1}{\sqrt{2}}\log|\sin x-\cos x|+c$, then :

(A) $A=\frac{1}{\sqrt{2}},\ f(x)=\sin x$ **(B)** $A=\sqrt{2},\ f(x)=\cos x$

(C) $A=\sqrt{2},\ f(x)=x$ **(D)** $A=\frac{1}{\sqrt{2}},\ f(x)=x$

99. $\int\left(\sqrt{\frac{\cos x}{x}}-\sqrt{\frac{x}{\cos x}}\cdot\sin x\right)dx$ equals :

(A) $-\sqrt{x\cos x}+C$ **(B)** $\sqrt{x\sin x}+C$ **(C)** $2\sqrt{x\cos x}+C$ **(D)** $C-2\sqrt{x\cos x}$

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

(A) $\frac{x^3}{(x^2+4x+1)^{1/2}}+C$ **(B)** $\frac{x}{(x^2+4x+1)^{1/2}}+C$

(C) $\frac{x^2}{(x^2+4x+1)^{1/2}}+C$ **(D)** $\frac{1}{(x^2+4x+1)^{1/2}}+C$

101. If $\int\frac{(2x+3)dx}{x(x+1)(x+2)(x+3)+1}=C-\frac{1}{f(x)}$ where $f(x)$ is of the form ax^2+bx+c, then the value of $f(1)$ is :

(A) 4 **(B)** 5 **(C)** 6 **(D)** None of these

102. The integral $\int\sqrt{\cot x}\,e^{\sqrt{\sin x}}\sqrt{\cos x}\,dx$ equals :

(A) $\frac{\sqrt{\tan x}\,e^{\sqrt{\sin x}}}{\sqrt{\cos x}}+C$ **(B)** $2e^{\sqrt{\sin x}}+C$

(C) $-\frac{1}{2}e^{\sqrt{\sin x}}+C$ **(D)** $\frac{\sqrt{\cot x}\,e^{\sqrt{\sin x}}}{2\sqrt{\cos x}}+C$

103. $\int\frac{dx}{x\sqrt{x^6+1}}$ equals :

(A) $\sec^{-1}x^3+C$ **(B)** $\frac{1}{6}\log\left(\frac{\sqrt{x^6+1}-1}{\sqrt{x^6+1}+1}\right)+C$

(C) $\frac{1}{3}\log\left(\frac{\sqrt{x^3+1}-1}{\sqrt{x^3+1}+1}\right)+C$ **(D)** $\frac{1}{3}\log\left(\frac{\sqrt{x^6+1}+1}{\sqrt{x^6+1}-1}\right)+C$

104. $\int\frac{\sin\left(\frac{\pi}{4}-x\right)dx}{2+\sin 2x}=A\tan^{-1}(f(x))+B$. where A, B are constants. Then the range of $Af(x)$ is :

(A) $[-1,1]$ **(B)** $[-\sqrt{2},\sqrt{2}]$ **(C)** $[0,1]$ **(D)** $[-1,0]$

105. If $\int\sqrt{x+\sqrt{x^2+2}}\,dx=A\{x+\sqrt{x^2+2}\}^{3/2}+\frac{B}{\sqrt{x+\sqrt{x^2+2}}}+c$, then the value of $3AB$ is :

(A) -1 **(B)** -2 **(C)** 1 **(D)** 2

106. $\int \frac{dx}{x^2\sqrt{16-x^2}}$ has the value equal to :

(A) $C-\frac{1}{4}\tan^{-1}\sec\left(\frac{x}{4}\right)$ **(B)** $\frac{1}{4}\tan^{-1}\sec\left(\frac{x}{4}\right)+C$

(C) $C-\frac{\sqrt{16-x^2}}{16x}$ **(D)** $\frac{\sqrt{16-x^2}}{16x}+C$

107. $\int \frac{\sqrt{1-x^2}-x}{\sqrt{1-x^2}(1+x\sqrt{1-x^2})}dx$ is :

(A) $2\tan^{-1}(x+\sqrt{1-x^2})+c$ **(B)** $\tan^{-1}(x+\sqrt{1-x^2})+c$

(C) $2\tan^{-1}(x-\sqrt{1-x^2})+c$ **(D)** $2\cot^{-1}(x+\sqrt{1-x^2})+c$

108. $\int \frac{3x^2+2x}{x^6+2x^5+x^4+2x^3+2x^2+5}dx =$

(A) $\frac{1}{4}\tan^{-1}\left(\frac{x^3+x^2+1}{2}\right)+c$ **(B)** $\frac{1}{2}\tan^{-1}\left(\frac{x^3+x^2+1}{2}\right)+c$

(C) $\sin^{-1}\left(\frac{x^3+x^2+1}{2}\right)+c$ **(D)** $\frac{1}{2}\tan^{-1}\left(\frac{x^3+x^2}{2}\right)+c$

109. $\int \frac{1}{(1+\sqrt{x})\sqrt{x-x^2}}dx$ is equal to :

(A) $2\left(\sqrt{\frac{x}{\sqrt{1-x}}}-\frac{1}{\sqrt{1-x}}\right)+c$ **(B)** $2\left(\sqrt{\frac{x}{\sqrt{1-x}}}-\frac{1}{1-x}\right)+c$

(C) $2\left(\sqrt{\frac{x}{1-x}}-\frac{1}{\sqrt{1-x}}\right)+c$ **(D)** $2\left(\sqrt{\frac{x}{1-x}}-\frac{1}{1-x}\right)+c$

110. If $f(x)=\int \frac{5x^8+7x^6}{(x^2+1+2x^7)^2}dx$ and $f(0)=0$, then the value of $f(1)$ is :

(A) $-1/2$ **(B)** $1/4$ **(C)** $1/2$ **(D)** $-1/4$

111. If $I=\int \frac{dx}{x^4\sqrt{a^2+x^2}}$, then I equals :

(A) $\frac{1}{a^4}\left[\frac{1}{x}\sqrt{a^2+x^2}-\frac{1}{3x^2}\sqrt{a^2+x^2}\right]+c$ **(B)** $\frac{1}{a^4}\left[\frac{1}{x}\sqrt{a^2+x^2}-\frac{1}{2\sqrt{x}}(a^2+x^2)^{3/2}\right]+c$

(C) $\frac{1}{a^4}\left[\frac{1}{x}\sqrt{a^2+x^2}-\frac{1}{3x^3}(a^2+x^2)^{3/2}\right]+c$ **(D)** $\frac{1}{a^4}\left[\frac{1}{x}\sqrt{a^2+x^2}+\frac{1}{3x^3}\sqrt{a^2+x^2}\right]+c$

112. $I=\int \frac{x^2(1-\log x)}{(\log x)^4-x^4}dx$ equals :

(A) $\frac{1}{2}\ln\left(\frac{x}{\ln x}\right)-\frac{1}{4}\ln(\ln^2 x-x^2)+C$ **(B)** $\frac{1}{4}\ln\left(\frac{\ln x-x}{\ln x+x}\right)-\frac{1}{2}\tan^{-1}\left(\frac{\ln x}{x}\right)+C$

(C) $\frac{1}{4}\ln\left(\frac{\ln x+x}{\ln x-x}\right)+\frac{1}{2}\tan^{-1}\left(\frac{\ln x}{x}\right)+C$ **(D)** $\frac{1}{4}\ln\left(\frac{\ln x-x}{\ln x+x}\right)+\tan^{-1}\left(\frac{\ln x}{x}\right)+C$

113. Evaluate : $\int \frac{(x-1)^2}{x^4+x^2+1}dx$

114. Evaluate : $\int \frac{x^2-4}{x^4+9x^2+16}dx$

115. $\int \frac{d(x^3)}{x^3(x^n+1)}$ equals :

(A) $\frac{3}{n}\ln\left(\frac{x^n}{x^n+1}\right)$ **(B)** $\frac{1}{n}\ln\left(\frac{x^n}{x^n+1}\right)$ **(C)** $\frac{3}{n}\ln\left(\frac{x^n+1}{x^n}\right)$ **(D)** $3n\ln\left(\frac{x^n+1}{x^n}\right)$

116. $\int \frac{(x+1)^2dx}{x(x^2+1)}$ is equal to :

(A) $\log_e x + c$ **(B)** $\log_e x + 2\tan^{-1}x + c$

(C) $\log_e \frac{1}{x^2+1} + c$ **(D)** $\log_e\{x(x^2+1)\} + c$

117. $\int \frac{x^3-x}{1+x^6}dx$ is equal to :

(A) $\frac{1}{6}\log\frac{x^4-x^2+1}{(1+x^2)^2}+C$ **(B)** $\frac{1}{6}\tan^{-1}\frac{(x^2+1)^2}{2}+C$

(C) $\log\frac{x^4-x^2+1}{(1+x^2)^2}+C$ **(D)** $\tan^{-1}\frac{(x^2+1)^2}{2}+C$

118. $\int \frac{(x^3-1)}{(x^4+1)(x+1)}dx$ is :

(A) $\frac{1}{4}\ln(1+x^4)+\frac{1}{3}\ln(1+x^3)+c$ **(B)** $\frac{1}{4}\ln(1+x^4)-\frac{1}{3}\ln(1+x^3)+c$

(C) $\frac{1}{4}\ln(1+x^4)-\ln(1+x)+c$ **(D)** $\frac{1}{4}\ln(1+x^4)+\ln(1+x)+c$

119. The value of $\int \frac{\cos^3 x}{\sin^2 x+\sin x}dx$ is equal to :

(A) $\log_e|\sin x|+\sin x+C$ **(B)** $\log_e|\sin x|-\sin x+C$

(C) $-\log_e|\sin x|-\sin x+C$ **(D)** $-\log_e|\sin x|+\sin x+C$

120. $\int \frac{x^3-1}{x^3+x}dx$ is equal to :

(A) $x-\log_e|x|+\log_e(x^2+1)-\tan^{-1}x+C$ **(B)** $x-\log_e|x|+\frac{1}{2}\log_e(x^2+1)-\tan^{-1}x+C$

(C) $x+\log_e|x|+\frac{1}{2}\log_e(x^2+1)+\tan^{-1}x+C$ **(D)** None of these

Paragraph for Questions 121 and 122

Let $f(x)=\int\frac{dx}{e^x+8e^{-x}+4e^{-3x}}$, $g(x)=\int\frac{dx}{e^{3x}+8e^x+4e^{-x}}$.

121. $\int (f(x)) - 2g(x)\,dx$

(A) $\frac{1}{2}\log\left|\frac{e^x + 2e^{-x} - 2}{e^x + 2e^{-x} + 2}\right| + C$ **(B)** $\frac{1}{4\sqrt{3}}\log\left|\frac{e^x - 2e^{-x} - 2\sqrt{3}}{e^x + 2e^{-x} + 2\sqrt{3}}\right| + C$

(C) $\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{e^x - 2e^{-x}}{2\sqrt{3}}\right) + C$ **(D)** $\frac{1}{2}\tan^{-1}\left(\frac{e^x + 2e^{-x}}{2}\right) + C$

122. $\int (f(x)) + 2g(x)\,dx$

(A) $\frac{1}{4\sqrt{3}}\log\left|\frac{e^x - 2e^{-x} - 2\sqrt{3}}{e^x + 2e^{-x} + 2\sqrt{3}}\right| + C$ **(B)** $\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{e^x - 2e^{-x}}{2\sqrt{3}}\right) + C$

(C) $\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{e^x - 2e^{-x}}{2\sqrt{3}}\right) + C$ **(D)** $\frac{1}{4}\log\left|\frac{e^x + 2e^{-x} - 2}{e^x + 2e^{-x} + 2}\right| + C$

123. Evaluate : $\int \cos 2x \log_e(1 + \tan x)\,dx$

124. Evaluate : $\int \sin 4x \cdot e^{\tan^2 x}\,dx$

125. Evaluate : $\int \frac{\log_e(1 + \sin^2 x)}{\cos^2 x}\,dx$

126. Evaluate : $\int \frac{x \log_e x}{(x^2 - 1)^{3/2}}\,dx$

127. $\int \frac{(2 + \sec x)\sec x}{(1 + 2\sec x)^2}\,dx =$

(A) $\frac{1}{2\,\text{cosec}\,x + \cot x} + C$ **(B)** $2\,\text{cosec}\,x + \cot x + C$

(C) $\frac{1}{2\,\text{cosec}\,x - \cot x} + C$ **(D)** $2\,\text{cosec}\,x - \cot x + C$

128. If $\int f(x)dx = g(x)$ and $f^{-1}(x)$ is differentiable, then $\int f^{-1}(x)dx$ is equal to :

(A) $g^{-1}(x) + C$ **(B)** $x\,f^{-1}(x) + C$ **(C)** $x\,f^{-1}(x) - g(f^{-1}(x)) + C$ **(D)** $f^{-1}(x) + C$

129. $\int \frac{e^{\cot x}}{\sin^2 x}(2\ln\text{cosec}\,x + \sin 2x)\,dx$

(A) $2e^{\cot x}\ln|\sin x| + c$ **(B)** $2e^{\tan x}\ln|\sin x| + c$

(C) $2e^{\cot x}\ln|\cos x| + c$ **(D)** $2e^{\tan x}\ln|\cos x| + c$

130. $\int \frac{1 - 7\cos^2 x}{\sin^7 x \cos^2 x}\,dx = \frac{f(x)}{(\sin x)^7} + C$, then $f(x)$ is equal to :

(A) $\sin x$ **(B)** $\cos x$ **(C)** $\tan x$ **(D)** $\cot x$

131. If $f(x) = \int e^x\left(\tan^{-1}x + \frac{2x}{(1 + x^2)^2}\right)dx$, $f(0) = 0$ then the value of $f(1)$ is :

(A) $e\left(\frac{\pi}{4} - \frac{1}{2}\right) + 1$ **(B)** $e\left(\frac{\pi}{4} + \frac{1}{2}\right) + 1$ **(C)** $e\left(\frac{\pi}{2} - \frac{1}{4}\right) + 1$ **(D)** $e^{-1}\left(\frac{\pi}{4} - \frac{1}{2}\right) + 1$