MATHS

BOOKS - ARIHANT MATHS (ENGLISH)

INDEFINITE INTEGRAL

Examples

1. If $\frac{d}{dx}\left[x^{n+1}+c\right]=(n+1)x^{n}$, then find $\int x^{n}dx$.

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2. If $\frac{d}{dx}(\sin x+c)=\cos x$, then find $\int \cos x dx$.

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3. Evaluate

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

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4. Evaluate

$$\int (x^2 + 5)^3 dx$$

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5. Evaluate $\int \tan^2 x dx$

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6. $\int \frac{dx}{\sin^2 x \cos^2 x}$ is equal to

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7. $\int \frac{\sin^6 x + \cos^6 x}{\sin^2 x \cos^2 x} dx$

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

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9. Evaluate: $\int \frac{x^3}{x + 2} dx$

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10. Evaluate

$\int \frac{x^2}{x^2 + 5} dx$

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11. Evaluate

$$\int 5^{\log_e x} dx$$

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12. Evaluate

$$\int 2^{\log_4 x} dx$$

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13. $$\int \frac{\left(\sqrt{x}+1\right)\left(x^2-\sqrt{x}\right)}{x\sqrt{x}+x+\sqrt{x}} dx$$

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14. Evaluate

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

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15. Evaluate

$$\int \frac{x^6 - 1}{(x^2 + 1)} dx$$

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

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17. $$\int \left(\frac{x^{-6} - 64}{4 + 2x^{-1} + x^{-2}} \cdot \frac{x^2}{4 - 4x^{-1} + x^{-2}} - \frac{4x^2(2x + 1)}{1 - 2x} \right) dx$$

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

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

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

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21. If $f'(x) = \frac{x}{2} + \frac{2}{x}$ and $f(1) = \frac{5}{4}$, then find $f(x)$.

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22. The gradient of the curve is given by $\frac{dy}{dx} = 2x - \frac{3}{x^2}$.

The curve passes through (1, 2) find its equation.

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23. By substitution: Theorem: $\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{a(n+1)}$

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24. Evaluate: $\int \frac{1}{\sqrt{3x+4}-\sqrt{3x+1}} dx.$

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25. Evaluate $\int \frac{8x+13}{\sqrt{4x+7}} dx.$

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26. Evaluate: $\int (7x-2)\sqrt{3x+2}\, dx$

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

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28. Evaluate $\int \frac{\sin(\log x)}{x} dx$

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29. Evaluate $\int \frac{e^{m \tan^{-1} x}}{1+x^2} dx$

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30. Evaluate $\int x \sin\left(4x^2+7\right) dx$

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31. Evaluate $\int \cos x \cos 2x \cos 5x dx$

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32. Evaluate $\int \sin x \cos x \cdot \cos 2x \cdot \cos 4x dx$

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33. $\int \frac{1 - \tan^2 x}{1 + \tan^2 x} dx$

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34. $\int \left[\frac{\cot^2 2x - 1}{2 \cot 2x} - \cos 8x \cot 4x \right] dx$

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

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

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37. Evaluate: $\int \frac{1}{\sqrt{1-e^{2x}}}\,dx$

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38. Evaluate: $\int \sqrt{\frac{x}{a^3-x^3}}dx$

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39. Evaluate: $\int \frac{\cos x}{\sqrt{\sin^2 x - 2\sin x - 3}}\,dx$

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41. Evaluate $\int \frac{2\sin 2x - \cos x}{6 - \cos^2 x - 4\sin x} dx.$

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

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43. Evaluate $\int x \sqrt{\frac{a^2 - x^2}{a^2 + x^2}} dx$

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44. Evaluate: $\int x \sqrt{1 + x - x^2}\, dx$

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45. Evaluate: $\int (x+1)\sqrt{1-x-x^2}\,dx$

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46. Evaluate $\int \frac{x^2+x+3}{x^2-x-2}dx.$

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47. Evaluate $\int \frac{2x^2+5x+4}{\sqrt{x^2+x+1}}dx.$

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48. Evaluate $\int \frac{1}{4\sin^2 x+9\cos^2 x}dx$

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49. Evaluate $\int \frac{\sin x}{\sin 3x}dx$

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50. Evaluate: $\int \frac{1}{2+\sin x+\cos x}\,dx$

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51. Evaluate: $\int \frac{1}{\sqrt{3}\sin x+\cos x}dx$

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52. Evaluate: $\int \frac{1}{\sqrt{3}\sin x+\cos x}dx$

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54. The value of $\int\{1+\tan x\cdot\tan(x+A)\}\,dx$ is

A. $\cot A\cdot\log\left|\frac{\sec x}{\sec(x+A)}\right|+C$

B. $\tan A\cdot\log|\sec(x+A)|+C$

C. $\cot A\cdot\log\left|\frac{\sec(x+A)}{\sec(x)}\right|+C$

D. None of these

Answer: C

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55. Integrate :

$\int\frac{\sqrt{\cos 2x}}{\sin x}dx$

A. $\log\left|\cot x+\sqrt{\cot^2 x-1}\right|+\sqrt{2}\log\left|\cos x+\sqrt{\cos^2 x-1/2}\right|+C$

B.

$-\log\left|\cot x+\sqrt{\cot^2 x-1}\right|+\sqrt{2}\log\left|\cos x+\sqrt{\cos^2 x-1/2}\right|+C$

C. $\log\left|\cot x+\sqrt{\cot^2 x-1}\right|+2\log\left|\cos x+\sqrt{\cos^2 x-1/2}\right|+C$

D. $-\log\left|\cot x+\sqrt{\cot^2 x-1}\right|+2\log\left|\cos x+\sqrt{\cos^2 x-1/2}\right|+C$

Answer: B

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56. Evaluate $\int \sin^{-1} x dx.$

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57. $\int \log_e x dx = \int \frac{1}{\log_x e} dx =$

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58. Evaluate $\int x \cos x dx.$

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59. Evaluate $\int x^2 \cos x dx$

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

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61. Evaluate $\int e^x \left(\frac{1 + \sin x \cos x}{\cos^2 x} \right) dx$

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62. Evaluate $\int e^{2x} \left(\frac{1 + \sin 2x}{1 + \cos 2x} \right) dx$

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

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64. Evaluate $\int e^x \cos^2 x dx$

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65. Evaluate: $\int \sin(\log x)\, dx$

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

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67. Evaluate: $\int \sqrt{\frac{3-x}{3+x}} \sin^{-1}\left(\frac{1}{6}\sqrt{3-x}\right) dx$

A. $\frac{1}{4}\left\{-3\left(\cos^{-1}\left(\frac{x}{3}\right)\right)^2 + 2\sqrt{9-x^2}\cdot\cos^{-1}\left(\frac{x}{3}\right) + 2x\right\} + C$

B. $\frac{1}{4}\left\{-3\left(\cos^{-1}\left(\frac{x}{3}\right)\right)^2 + 2\sqrt{9-x^2}\sin^{-1}\left(\frac{x}{3}\right) + 2x\right\} + C$

C. $\frac{1}{4}\left\{-3\left(\sin^{-1}\left(\frac{x}{3}\right)\right)^2 + 2\sqrt{9-x^2}\sin^{-1}\left(\frac{x}{3}\right) + 2x\right\} + C$

D. None of the above

Answer: A

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68. The value of $\int \frac{\sec x(2+\sec x)}{(1+2\sec x)^2} dx$, is equal to

A. $\frac{\sin x}{2+\cos x} + C$

B. $\frac{\cos x}{2+\cos x} + C$

C. $\frac{-\sin x}{2+\sin x} + C$

D. $\frac{\cos x}{2+\sin x} + C$

Answer: A

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69. The value of $\int \log\left(\sqrt{1-x}+\sqrt{1+x}\right)dx$, is equal to

A. $x\log\left(\sqrt{1-x}+\sqrt{1+x}\right)+\frac{1}{2}x-\frac{1}{2}\sin^{-1}(x)+C$

B. $x\log\left(\sqrt{1-x}+\sqrt{1+x}\right)+\frac{1}{2}x+\frac{1}{2}\sin^{-1}(x)+C$

C. $x\log\left(\sqrt{1-x}+\sqrt{1+x}\right)-\frac{1}{2}x+\frac{1}{2}\sin^{-1}(x)+C$

D. None of the above

Answer: C

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70. If

$\int(\sin 3\theta+\sin\theta)\cos\theta e^{\sin\theta}d\theta=\left(A\sin^3\theta+B\cos^2\theta+C\sin\theta+D\cos\theta+I\right.$

then:

A. $A = -4, B = 12$

B. $A = -4, B = -12$

C. $A = 4, B = 12$

D. $A = 4, B = -12$

Answer: B

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71. $\int e^{x \sin x + \cos x} \left(\frac{x^4 \cos^3 x - x \sin x + \cos x}{x^2 \cos^2 x} \right) dx =$

A. $e^{(x \sin x + \cos x)} \cdot \left(x + \frac{1}{x \cos x} \right) + C$

B. $e^{(x \sin x + \cos x)} \cdot \left(x \cos x \frac{1}{x} \right) + C$

C. $e^{(x \sin x + \cos x)} \cdot \left(x - \frac{1}{x \cos x} \right) + C$

D. None of the above

Answer: C

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72. Evaluate: $\int \sin^{-1}\left(\frac{2x+2}{\sqrt{4x^2+8x+13}}\right)dx$

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73. $\int \frac{x^2\left(x\sec^2 x+\tan x\right)}{\left(x\tan x+1\right)^2}$ dx

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74. $\frac{2x+1}{(x+1)(x-2)}$ into partial fractions

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75. Resolve $\frac{1}{(x-1)(x+2)(2x+3)}$ into partial fractions.

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76. Resolve $\frac{3x^3+2x^2+x+1}{(x+1)(x+2)}$ into partial fraction

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77. Expression $\frac{x+5}{(x-2)^2}$ has repeated (twice) linear factors in denominator, so find partial fractions.

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78. Resolve $\frac{3x-2}{(x-1)^2(x+1)(x+2)}$ into partial fractions.

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79. Resolve $\frac{2x+7}{(x+1)(x^2+4)}$ into partial fractions.

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80. Find the partial fraction

$$\frac{2x+1}{(3x+2)(4x^2+5x+6)}.$$

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81. Resolve $\frac{2x^4+2x^2+x+1}{x(x^2+1)^2}$ into partial fractions.

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82. Evaluate: $\int \frac{(1-x^2)}{x\,(1-2x)}\,dx$

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83. Evaluate $\int \frac{3x-1}{(x-2)^2}dx$

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

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85. Evaluate $\int \frac{8dx}{(x+2)(x^2+4)}$

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86. Evaluate $\int \frac{1}{\sin x - \sin 2x} dx.$

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87. Evaluate: $\int \frac{(1 - x \sin x)dx}{x(1 - x^3 e^{3\cos x})}$

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88. Evaluate $\int \sin 4x . e^{\tan^2 x} dx.$

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89. If $\int\sqrt{\text{cosec}x+1}dx=kfog(x)+c,$ where k is a real constant, then

A. $2/5, 5/2$

B. $1/5, 2/5$

C. $5/2, 1/2$

D. $2/5, 1/2$

Answer: A

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90. Evaluate $\int\frac{5x^4+4x^5}{\left(x^5+x+1\right)^2}dx$

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91. For any natural number m, evaulate,

$$\int \left(x^{3m}+x^{2m}+x^{m}\right)\left(2x^{2m}+3x^{9}m\right)+6^{t/m}dx,\ x>0$$

$$\int \frac{x^2-1}{x^3\sqrt{2x^4-2x^2+1}}\ \text{dx is equal to:}$$

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

A. (a) $\frac{1}{2}\ln\left(1+\sqrt{1+x^2}\right)+C$

B. (b) $2\sqrt{1+\sqrt{1+x^2}}+C$

C. (c) $2\left(1+\sqrt{1+x^2}\right)+C$

D. (d) None of these

Answer: B

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

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

Answer: B

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94. $\int \frac{px^{p+2q-1} - qx^{q-1}}{x^{2p+2q} + 2x^{p+q} + 1} dx$ is equal to

A. $-\frac{x^p}{x^{p+q}+1} + C$

B. $\frac{x^q}{x^{p+q}+1} + C$

C. $-\frac{x^q}{x^{p+q}+1} + C$

D. $\frac{x^p}{x^{p+q}+1} + C$

Answer: C

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95. $\int \frac{x^2(1-\ln x)}{\left(\ln^4 x - x^4\right)dx}$ is equal to

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96. Let $f(x) = \frac{x}{(1+x^n)^{1/n}}$ for $n \geq 2$ and $g(x) = \underbrace{fofo...of(x)}_{\text{n times}}$, then $\int x^{n-2} g(x)dx$ equals to

A. $\frac{1}{n(n-1)}(1+nx^n)^{1-\frac{1}{n}} + C$

B. $\frac{1}{n-1}(1+nx^n)^{1-\frac{1}{n}} + C$

C. $\frac{1}{n(n+1)}(1+nx^n)^{1+\frac{1}{n}} + C$

D. $\frac{1}{n+1}(1+nx^n)^{1+\frac{1}{n}} + C$

Answer: A

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97. $\int \frac{5}{1+x^4} dx$

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98. $\int \frac{1}{x^4+5x^2+1} dx$

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99. $\int \sqrt{\tan x} dx$

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

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

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102. Evaluate: $\int \frac{x^{-\frac{7}{6}}-x^{\frac{5}{6}}}{x^{\frac{1}{3}}(x^2+x+1)^{\frac{1}{2}}-x^{\frac{1}{2}}(x^2+x+1)^{\frac{1}{3}}}dx$

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

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

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

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106. Evaluate: $\int \frac{(x-1)\sqrt{x^4+2x^3-x^2+2x+1}}{x^2(x+1)}dx$

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107. Evaluate $\int \frac{dx}{(x-3)^3\sqrt{x^2-6x+10}}$.

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108. Evaluate the following integral

$$\int \frac{\left(2x^2+5x+9\right)dx}{(x+1)\sqrt{x^2+x+1}}$$

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109. Evaluate: (i) $\int \sin^3 x \cos^5 x \, dx$ (ii) $\int \frac{1}{\sin^4 x \cos^2 x} \, dx$

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110. $\int (\sin x)^{-\frac{11}{3}} (\cos x)^{-\frac{1}{3}} dx$

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111. Evaluate $\int \frac{dx}{2 \sin x + \sec x}$.

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112. Evaluate $\int x^{1/3} \left(2 + x^{1/2}\right)^2 dx$.

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113. Evaluate $\int x^{-2/3} \left(1 + x^{2/3}\right)^{-1} dx$.

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114. Evaluate $\int x^{-2/3}\left(1+x^{1/3}\right)^{1/2} dx.$

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115. $\int x^5\left(1+x^3\right)^{\frac{2}{3}} dx$

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116. If $I = \int x^{-11}\left(1+x^4\right)^{-1/2} dx$

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117. $\int \frac{dx}{\sqrt[3]{x}+\sqrt[4]{x}}$

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118. Evaluate: $\int \frac{x}{(7x-10-x^2)^{3/2}} dx$

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119. Evaluate: $\int \frac{1}{x+\sqrt{x^2-x+1}} dx$

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120. Evaluate $l_n = \int \frac{dx}{(x^2+a^2)^n}$.

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121. Derive reduction formula for

$l_{(n,m)} = \int \frac{\sin^n x}{\cos^m x} dx.$

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122. Evaluate $\int \frac{dx}{(5+4\cos x)^2}$.

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123. Evaluate $\int \frac{dx}{(16+9\sin x)^2}$.

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124. Evaluate $\int \frac{dx}{(\sin x + a\sec x)^2}, a \in Z.$

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125. Evaluate:

$$\int \frac{e^{\tan \hat{} ((-1)x)}}{(1+x^2)} \left[\left(\left(\sec^{-1} \sqrt{1+x^2} \right)^2 + \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right) \right] dx (x > 0).$$

A. $e^{\tan^{-1} x} \cdot \tan^{-1} x + C$

B. $\frac{e^{\tan^{-1} x} \cdot (\tan^{-1} x)^2}{2} + C$

C. $e^{\tan^{-1}x} \cdot \left(\sec^{-1}\left(\sqrt{1+x^2}\right)\right)^2 + C$

D. $e^{\tan^{-1}x} \cdot \left(\cos ec^{-1}\left(\sqrt{1+x^2}\right)\right)^2 + C$

Answer: C

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126. If $I = \int \frac{e^x}{e^{4x} + e^{2x} + 1} dx$. $J = \int \frac{e^{-x}}{e^{-4x} + e^{-2x} + 1} dx$. Then for an arbitrary constant c, the value of $J - I$ equal to

A. $\frac{1}{2}\log\left(\frac{e^{4x} - e^{2x} + 1}{e^{4x} + e^{2x} + 1}\right) + C$

B. $\frac{1}{2}\log\left(\frac{e^{2x} + e^x + 1}{e^{2x} - e^x + 1}\right) + C$

C. $\frac{1}{2}\log\left(\frac{e^{2x} - e^x + 1}{e^{2x} + e^x + 1}\right) + C$

D. $\frac{1}{2}\log\left(\frac{e^{4x} + e^{2x} + 1}{e^{4x} - e^{2x} + 1}\right) + C$

Answer: C

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127. Integral of $\sqrt{1+2\cot x(\cot x+\cos ecx)}$ w.r.t. x, is

A. $2\ln\cos.\frac{x}{2}+C$

B. $2\ln\sin.\frac{x}{2}+C$

C. $\frac{1}{2}\ln\cos.\frac{x}{2}+C$

D. $\ln\sin x-\ln(\cos ecx-\cot x)+C$

Answer: B

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128. Let $f(x)=x+\sin x$. Suppose g denotes the inverse function of f. The value of $g'\left(\frac{\pi}{4}+\frac{1}{\sqrt{2}}\right)$ has the value equal to

A. $\sqrt{2}-1$

B. $\frac{\sqrt{2}+1}{\sqrt{2}}$

C. $2-\sqrt{2}$

D. $\sqrt{2}+1$

Answer: C

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129. $\int \frac{dx}{\sqrt{(x-a)(b-x)}}$

A. $2\sin^{-1}\sqrt{\frac{x-a}{b-a}}+C$

B. $2\sin^{-1}\sqrt{\frac{x-b}{b-a}}+C$

C. $\sin^{-1}\sqrt{\frac{x-a}{b-a}}+C$

D. None of these

Answer: A

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130. $\int \frac{x-1}{x+1}\cdot\frac{1}{\sqrt{x^3+x^2+x}}dx$

A. $2\tan^{-1}\sqrt{\frac{x+1}{x}}+C$

B. $\tan^{-1}\sqrt{\frac{x^2+x+1}{x}}+C$

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

D. None of these

Answer: C

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131. $I=\int\frac{dx}{\left(a+dx^2\right)\sqrt{b-ax^2}}$

A. $\frac{1}{\sqrt{a(a^2+b^2)}}\tan^{-1}\left(\frac{x\sqrt{a^2+b^2}}{a\sqrt{b-ax^2}}\right)+C$

B. $\frac{1}{\sqrt{(a^2+b^2)}}\tan^{-1}\left(\frac{x\sqrt{a^2+b^2}}{a\sqrt{b-ax^2}}\right)+C$

C. $\frac{1}{\sqrt{a(a^2+b^2)}}\tan^{-1}\left(\frac{x\sqrt{a^2+b^2}}{a}\right)+C$

D. None of the above

Answer: A

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132. The value of $I = \int \frac{dx}{2x\sqrt{1-x}\sqrt{(2-x)+\sqrt{1-x}}} = -\frac{1}{2}\left\{\log\left(z+\frac{3}{2}+\sqrt{z^2+3z+\right.\right.$ and $s-z=\frac{k}{x}$, then value of k, is

A. 1

B. 2

C. 3

D. 4

Answer: B

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133. If $\int \frac{dx}{(x^2+a^2)^3} = \frac{x}{4a^2(x^2+a^2)} + \frac{m}{na^2}\left\{\frac{x}{2a^2(x^2+a^2)} + \frac{1}{2a^3}\tan^{-1}\left(\frac{x}{a}\right)\right\}$ then $|m-n|$ is equal to

A. 4

B. 3

C. 2

D. 1

Answer: D

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134. If $y(x-y)^2 = x$, then $\int \frac{1}{x-3y} dx$ is equal to (A) $\frac{1}{3}\log\left\{(x-y)^2+1\right\}$ (B) $\frac{1}{4}\log\left\{(x-y)^2-1\right\}$ (C) $\frac{1}{2}\log\left\{(x-y)^2-1\right\}$ (D) $\frac{1}{6}\log\left\{(x^2-y^2-1\right\}$

A. 1

B. 3

C. 5

D. 7

Answer: C

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135. If $\int\left(x+\sqrt{1+x^2}\right)^n dx.$

$$=\frac{1}{a(n+1)}\left\{x+\sqrt{1+x^2}\right\}^{n+1}+\frac{1}{-b(n-1)}\left\{x+\sqrt{1+x^2}\right\}^{n-1}+C$$

Then $(a+b)$ is equal to

A. 2

B. 3

C. 4

D. 5

Answer: C

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136. If $\int \frac{f(x)}{x^3-1}dx$, where $f(x)$ is a polynomial of degree 2 in x such that $f(0)=f(1)=3f(2)=-3$ and $\int \frac{f(x)}{x^3-1}dx = -\log|x-1|+\log|x^2+x+1|+\frac{m}{\sqrt{n}}\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right)+$. Then $(2m+n)$ is

A. 3

B. 5

C. 7

D. 9

Answer: C

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137. The value of $\int \frac{(1+x)}{x(1+xe^x)^2}dx$, is equal to

A. (a) $\log\left|\frac{x}{1+xe^x}\right|+\frac{1}{(1+xe^x)}+C$

B. (b) $\log\left|\frac{xe^x}{1+xe^x}\right|+\frac{1}{1+xe^x}+C$

C. (c) $\log\left|\frac{xe^x}{1+e^x}\right|+\frac{1}{1+xe^x}+C$

D. (d) None of the above

Answer: B

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138. The value of $\int\frac{dx}{x+\sqrt{a^2-x^2}}$, is equal to

A. $\frac{1}{2}\sin^{-1}\left(\frac{x}{a}\right)+\frac{1}{2}\log\left|x+\sqrt{a^2-x^2}\right|+C_1$

B. $\frac{1}{2}\sin^{-1}\left(\frac{x}{a}\right)-\frac{1}{2}\log\left|x+\sqrt{a^2-x^2}\right|+C_1$

C. $\frac{1}{2}\sin^{-1}\left(\frac{x}{a}\right)-\log\left|x+\sqrt{a^2-x^2}\right|+C_1$

D. $\frac{1}{2}\cos^{-1}\left(\frac{x}{a}\right)+\frac{1}{2}\log\left|x+\sqrt{a^2-x^2}\right|+C_1$

Answer: A

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

A. $\frac{1}{\sqrt{2}}\sec^{-1}\left(\frac{x^2+1}{\sqrt{2}x}\right)+C$

B. $\sqrt{2}\sec^{-1}\left(\frac{x^2+1}{\sqrt{2}x}\right)+C$

C. $\frac{1}{\sqrt{2}}\cos ec^{-1}\left(\frac{x^2+1}{\sqrt{2}x}\right)+C$

D. $\sqrt{2}\cos ec^{-1}\left(\frac{x^2+1}{\sqrt{2}x}\right)+C$

Answer: A

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140. $\int \frac{\sqrt{4+x^2}}{x^6}dx = \frac{A\left(4+x^2\right)^{3/2}\left(Bx^2-6\right)}{x^5}+C$, then

A. $A = \frac{1}{120}$

B. $B = 1$

C. $A = -\frac{1}{120}$

D. $B = -1$

Answer: A::B

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141. he value of the integral $\int e^{\sin^{2x}}\left(\cos x+\cos^3 x\right)\sin x dx$ is

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

B. $e^{\sin^2 x}\left(1+\frac{1}{2}\cos^2 x\right)+C$

C. $e^{\sin^2 x}\left(3\cos^2 x+2\sin^2 x\right)+C$

D. $e^{\sin^2 x}\left(2\cos^2 x+3\sin^2 x\right)+C$

Answer: A::B

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142. Find $\int\left(\sqrt{\cot x}+\sqrt{\tan x}\right)dx$

A. $\sqrt{2}\sin^{-1}(\sin x-\cos x)$

B. $\frac{\pi}{2} - \sqrt{2}\cos^{-1}(\sin x - \cos x)$

C. $\sqrt{2}\tan^{-1}\left(\frac{\tan x - 1}{\sqrt{2}\sqrt{\tan x}}\right)$

D. None of these

Answer: A::B::C

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143. For integral $\int f\left(x - \frac{a}{x}\right) \cdot \left(1 + \frac{a}{x^2}\right) dx$, put $x - \frac{a}{x} = t$

For integral $\int f\left(x + \frac{a}{x}\right) \cdot \left(1 - \frac{a}{x^2}\right) dx$, put $x + \frac{a}{x} = t$

For integral $\int f\left(x^2 - \frac{a}{x^2}\right) \cdot \left(x + \frac{a}{x^3}\right) dx$, put $x^2 - \frac{a}{x^2} = t$

For integral $\int f\left(x^2 + \frac{a}{x^2}\right) \cdot \left(x - \frac{a}{x^3}\right) dx$, put $x^2 + \frac{a}{x^2} = t$

many integrands can be brought into above forms by suitable reductions or transformations .

$$\int \frac{x^4 - 2}{x^2\sqrt{x^4 + x^2 + 2}} dx$$

A. $\sqrt{x^2 + 1 + \frac{1}{x^2}} + C$

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

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

D. $\sqrt{x^2+\frac{2}{x^2}}+C$

Answer: B

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144. For integral $\int f\left(x-\frac{a}{x}\right)\cdot\left(1+\frac{a}{x^2}\right)dx$, put $x-\frac{a}{x}=t$

For integral $\int f\left(x+\frac{a}{x}\right)\cdot\left(1-\frac{a}{x^2}\right)dx$, put $x+\frac{a}{x}=t$

For integral $\int f\left(x^2-\frac{a}{x^2}\right)\cdot\left(x+\frac{a}{x^3}\right)dx$, put $x^2-\frac{a}{x^2}=t$

For integral $\int f\left(x^2+\frac{a}{x^2}\right)\cdot\left(x-\frac{a}{x^3}\right)dx$, put $x^2+\frac{a}{x^2}=t$

many integrands can be brought into above forms by suitable reductions or transformations .

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

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

B. $\tan^{-1}\sqrt{x+\frac{1}{x}+1}+C$

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

D. None of these

Answer: C

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145. For integral $\int f\left(x-\frac{a}{x}\right)\cdot\left(1+\frac{a}{x^2}\right)dx$, put $x-\frac{a}{x}=t$

For integral $\int f\left(x+\frac{a}{x}\right)\cdot\left(1-\frac{a}{x^2}\right)dx$, put $x+\frac{a}{x}=t$

For integral $\int f\left(x^2-\frac{a}{x^2}\right)\cdot\left(x+\frac{a}{x^3}\right)dx$, put $x^2-\frac{a}{x^2}=t$

For integral $\int f\left(x^2+\frac{a}{x^2}\right)\cdot\left(x-\frac{a}{x^3}\right)dx$, put $x^2+\frac{a}{x^2}=t$

many integrands can be brought into above forms by suitable reductions or transformations .

$$\int\frac{5x^4+4x^5}{\left(x^5+x+1\right)^2}dx$$

A. $x^5+x+1+C$

B. $\frac{x^5}{x^5+x+1}+C$

C. $x^{-4}+x^{-5}+C$

D. $\frac{x^5}{x^5+x+1}+C$

Answer: D

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146. If the primitive of the function $f(x) = \frac{x^{2009}}{(1+x^2)^{1006}}$ w.r.t. x is equal to $\frac{1}{n}\left(\frac{x^2}{1+x^2}\right)^m + C$, then $\frac{n}{m}$ is equal to .....

A.

B.

C.

D.

Answer: 2

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147. Suppose $\begin{vmatrix} f'(x) & f(x) \\ f''(x) & f'(x) \end{vmatrix} = 0$ where $f(x)$ is continuous differentiable function with $f'(x) \neq 0$ and satisfies $f(0) = 1$ and $f'(0) = 2$, then $f(x) = e^{\lambda x} + k$, then $\lambda + k$ is equal to .....

A. a) 2

B. b) 4

C. c) 0

D. d) -2

Answer: 2

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148. If $I_n = \int z^n e^{1/z} dz$, then show that $(n+1)!I_n = I_0 + e^{1/z}\left(1!z^2 + 2!z^3 + ... + n!z^{n+1}\right)$.

A.

B.

C.

D.

Answer:

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149. If $I_n = \int x^n \sqrt{a^2 - x^2} dx$, prove that $I_n = -\frac{x^{n-1}\left(a^2 - x^2\right)^{\frac{3}{2}}}{(n+2)} + \frac{(n+1)}{(n+2)} a^2 I_{n-2}$

A.

B.

C.

D.

Answer:

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150. If $I_m = \int (\sin x + \cos x)^m dx$, then show that $ml_m = (\sin x + \cos x)^{m-1} \cdot (\sin x - \cos x) + 2(m-1)I_{m-2}$

A.

B.

C.

D.

Answer:

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151. If $I_{m,n} = \int \cos^m x \cdot \cos nx dx$, show that $(m+n)I_{m,n} = \cos^m x \cdot \sin nx + mI_{(m-1,n-1)}$

A.

B.

C.

D.

Answer: $(m+n)I_{m,n} = \cos^m x \cdot \sin nx + mI_{m-1,\ n-1}$

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152. $\int \frac{\tan\left(\frac{\pi}{4} - x\right)}{\cos^2 x \sqrt{\tan^3 x + \tan^2 x + \tan x}} dx$

A.

B.

C.

D.

Answer: $-2\tan^{-1}\left(\sqrt{\tan x + 1 + \frac{1}{\tan x}}\right) + C$

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153. Evaluate $\int \frac{x^2 + n(n-1)}{(x \sin x + n \cos x)^2} dx.$

A.

B.

C.

D.

Answer:

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154. Evaluate $\int \left\{ \log\left(\frac{1+\sin 2\theta}{1-\sin\theta}\right)^{\cos^2\theta} + \log\left(\frac{\cos 2\theta}{1+\sin 2\theta}\right) \right\} d\theta.$

A.

B.

C.

D.

Answer: $\frac{\sin 2\theta}{2}\log\left(\frac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}\right)+\frac{1}{2}\log|\cos 2\theta|+C$

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155. Evaluate $\int\frac{\tan^{-1}x}{x^4}dx.$

A.

B.

C.

D.

Answer: $-\frac{\tan^{-1}x}{3x^3}-\frac{1}{6}\log\left|\frac{x^2+1}{x^2}\right|-\frac{1}{6x^2}+C$

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

A.

B.

C.

D.

Answer: $\frac{4}{3}\left(\frac{x-1}{x+2}\right)^{1/4}+C$

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Exercise For Session 1

1. Evaluate the following integration

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

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2. Evaluate the following integration

$$\int \frac{x^2+3}{x^6(x^2+1)}dx$$

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3. Evaluate the following integration

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

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4. Evaluate the following integration

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

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5. Evaluate the following integration

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

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6. Evaluate the following integration

$$\int \frac{\left(x^2+\sin^2 x\right)\sec^2 x}{\left(1+x^2\right)}dx$$

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7. Evaluate: $\int \frac{x^2}{(a+bx)^2}\,dx$

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8. Evaluate the following integration

$$\int 2^x \cdot e^x \cdot dx$$

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9. Evaluate: $\int \frac{e^{3x}+e^{5x}}{e^x+e^{-x}}dx$

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10. $\int (e^{x \log a} + e^{a \log x}) dx$

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11. $\int \frac{1 + \cos 4x}{\cot x - \tan x} dx$

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12. Evaluate : $\int \tan x \tan 2x \tan 3x dx$

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13. Evaluate the following integration

$\int \frac{\sin 4x}{\sin x} dx$

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14. Evaluate the following integration

$$\int \cos^3 x dx$$

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15. Evaluate the following integration

$$\int \sin^3 x \cos^3 x dx$$

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Exercise For Session 2

1. Solve the following integration

$$\int \frac{dx}{1+\sin x}$$

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2. Solve the following integration

$$\int \frac{\cos x - \sin x}{\cos x + \sin x} \cdot (2 + 2\sin 2x)\, dx$$

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3. $\int \left(3\sin x \cos^2 x - \sin^3 x\right) dx$

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4. Solve the following integration

$$\int \cos x^{\circ}\, dx$$

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5. Solve the following integration

$$\int \frac{\sin x + \cos x}{\sqrt{1 + \sin 2x}} \cdot dx, \text{ here } (\sin x + \cos x) > 0$$

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6. Evaluate $\int \frac{\cos 2x - \cos 2\theta}{\cos x - \cos \theta} dx$

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7. Integrate the functions $\frac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x}$

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8. Evaluate $\int \sec^2 x \cdot \cos ec^2 x dx$

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9. Solve the following integration

$\int \sqrt{1 - \sin 2x} dx$

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10. $\int \frac{\sin^6 x + \cos^6 x}{\sin^2 x \cos^2 x} dx$

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11. $\int \left[\sin^2\left(\frac{9\pi}{8} + \frac{x}{4}\right) - \sin^2\left(\frac{7\pi}{8} + \frac{x}{4}\right)\right] dx$

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12. $\int \frac{\cos 4x - 1}{\cot x - \tan x} dx$ is equal to

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13. $\int \left[\sin\alpha \sin(x - \alpha) + \sin^2\left(\frac{x}{2} - \alpha\right)\right] dx$

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14. Solve the following integration

$$\int \frac{\sin 2x + \sin 5x - \sin 3x}{\cos x + 1 - 2\sin^2 2x} dx$$

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15. $\int \frac{\cos^4 x - \sin^4 x}{\sqrt{1 + \cos 4x}} dx, (\cos 2x > 0)$

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Exercise For Session 3

1. Evaluate the following integrals

$$\int \frac{x dx}{9 - 16x^4}$$

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2. $\int \frac{x^2}{9 + 16x^6} dx$

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3. Evaluate the following integrals

$$\int \frac{x^3 dx}{16x^8 - 25}$$

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4. Evaluate the following integrals

$$\int \sqrt{\frac{x}{a^3 - x^3}} dx$$

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5. $$\int \sqrt{\frac{x^4}{a^6 + x^6}} dx$$

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

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7. Evaluate the following integrals

$$\int \frac{2^x}{\sqrt{4^x - 25}} dx$$

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8. Evaluate: $\int \frac{8x - 11}{\sqrt{5 + 2x - x^2}} \text{dx}$

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9. Evaluate: $\int \frac{x + 2}{\sqrt{x^2 + 2x + 3}}$

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10. Evaluate the following integrals $\int \frac{x - 3}{\sqrt{3 - 2x - x^2}} dx$

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11. Evaluate the following integrals

$$\int \sqrt{\frac{a-x}{x-b}}dx$$

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12. Evaluate the following integrals

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

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13. Evaluate the following integral

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

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14. Evaluate the following integrals

$$\int \frac{dx}{1+\sin x+\cos x}$$

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15. Evaluate: $\int \frac{1}{\sin x+\sqrt{3}\cos x}\,dx$

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16. Evaluate the following integrals

$$\int \frac{\cos^2 x \sin x}{\sin x-\cos x}dx$$

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17. Evaluate : $\int \frac{e^x}{\sqrt{5-4e^x-e^{2x}}}\,dx$

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18. Evaluate the following integrals

$$\int \sqrt{\frac{\cos x - \cos^3 x}{(1 - \cos^3 x)}} dx$$

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19. Evaluate the following integrals

Evaluate $\int \frac{3 \sin x + 2 \cos x}{3 \cos x + 2 \sin x} dx$

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20. Evaluate the following integrals

Evaluate $\int (2x - 4)\sqrt{4 + 3x - x^2} dx.$

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21. Evaluate the following integral

$$\int \frac{\left(2x^2 + 5x + 9\right) dx}{(x + 1)\sqrt{x^2 + x + 1}}$$

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22. $\int \frac{dx}{\sec x + \text{cosec x}}$

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

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

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

D. None of these

Answer: C

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Exercise For Session 4

1. $\int x^2 e^x dx$

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

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3. ज्ञात करें $\int \log x dx$

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4. Evaluate: $\int (\log x)^2 \, dx$

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5. $\int (\tan^{-1} x) dx$

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6. $\int \sec^{-1} x dx$

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7. $\int \mathrm{x} \tan^{-1} \mathrm{x} \, \mathrm{dx}$

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8. Evaluate: $\int \frac{\log x}{x^2} dx$

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9. Evaluate: $\int \frac{x - \sin x}{1 - \cos x} dx$

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10. Evaluate: $\int \log\left(1 + x^2\right) dx$

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11. Evaluate: $\int e^x \left(\tan x + \log \sec x\right) dx$

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12. Evaluate: $\int e^x \left(\frac{1 + \sin x \cos x}{\cos^2 x}\right) dx$

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

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14. Evaluate $\int e^{2x} \left(\frac{1 + \sin 2x}{1 + \cos 2x}\right) dx$

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

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16. Evaluate: $\int \frac{e^x\left(2-x^2\right)dx}{(1-x)\sqrt{1-x^2}}$

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17. Evaluate: $\int e^{ax} \cos(bx+c)\, dx$

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18. Evaluate $\int \sec^3 x dx.$

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19. Evaluate: $\int \sin \sqrt{x}\, dx$

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20. Evaluate: $\int \left(\sin^{-1} x\right)^2 dx$

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21. The value of the integral $\int_0^1 \cot^{-1}\left(1 - x + x^2\right) dx$, is

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22. Evaluate the following integrals: $\int_0^a (\sin)_1 \sqrt{\frac{x}{a+x}} dx$

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23. Find : $\int\left(\sqrt{x^2+1}\frac{\log\left(x^2+1\right)-2\log x}{x^4}dx\right.$

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24. $\int\frac{\cos^2 x+\sin 2x}{\left(2\cos x-\sin x\right)^2}dx$

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25. Evaluate $\int\frac{e^{\sin x}}{\cos^2 x}\left(x\cos^3 x-\sin x\right)dx$

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Exercise For Session 5

1. Evaluate the following Integrals :

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

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2. Evaluate the following Integrals :

$$\int \frac{dx}{1+x^3}$$

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3. Evaluate the following Integrals :

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

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

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5. Evaluate the following Integrals :

$$\int \frac{\cos x}{(1+\sin x)(2+\sin x)} dx$$

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6. Evaluate the following Integrals :

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

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7. $\int \frac{\sec x}{1+cosecx} dx$

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8. Evaluate $\int \frac{\tan x + \tan^3 x}{1+\tan^3 x} dx$

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9. Prove that : $\int \frac{1}{x\left[6(\log x)^2+7\log x+2\right]}dx=\log\left|\frac{1+\log x^2}{2+\log x^3}\right|+c$

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10. Evaluate the following Integrals :

$\int \frac{\tan^{-1}x}{x^2}dx$

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Exercise For Session 6

1. Evaluate the following Integrals :

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

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2. Evaluate the following Integrals :

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

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3. Evaluate the following Integrals :

$$\int \frac{dx}{(x+1)^{1/2}+(x+1)^{1/2}}$$

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4. $\int \frac{dx}{(x+a)^{\frac{8}{7}}(x-b)^{\frac{6}{7}}} =$

A. $\frac{7}{(a+b)}\left(\frac{x+a}{x-b}\right)^{1/7}+C$

B. $\frac{7}{(a+b)}\left(\frac{x-b}{x+a}\right)^{1/7}+C$

C. $\frac{6}{(a+b)}\left(\frac{x-b}{x+a}\right)^{1/7}+C$

D. $\frac{6}{(a+b)}\left(\frac{x+a}{x-b}\right)^{1/7}+C$

Answer: B

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5. $\int \frac{\sec x}{\sqrt{\sin(2x+\alpha)+\sin\alpha}} dx$

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6. The value of $\int (\{[x]\}) dx$ where {.} and [.] denotes the fractional part of x and greatest integer function equals

A. 0

B. 1

C. 2

D. -1

Answer: A

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7. If $\int f(x)\cos x dx = \frac{1}{2}f^2(x) + C$, then $f(x)$ can be

A. x

B. 1

C. cos x

D. sin x

Answer: D

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8. Evaluate : $\int \frac{\sin x + \cos x}{9 + 16\sin 2x} dx.$

A. $\frac{1}{40}\log\left|\frac{5 + 4(\sin x - \cos x)}{5 - 4(\sin x - \cos x)}\right| + C$

B. $\log\left|\frac{5 + 4(\sin x - \cos x)}{5 - 4(\sin x - \cos x)}\right| + C$

C. $\frac{1}{10}\log\left|\frac{5 + 4(\sin x + \cos x)}{5 - 4(\sin x + \cos x)}\right| + C$

D. None of these

Answer: A

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9. The value of $\int \frac{\cos 8x - \cos 7x}{1 + 2\cos 5x} dx$, is

A. $\frac{\sin 2x}{2} + \frac{\cos 3x}{3} + C$

B. $\sin x - \cos x + C$

C. $\frac{\sin 2x}{2} - \frac{\cos 3x}{3} + C$

D. None of these

Answer: D

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10. $\int \frac{\cos 5x + \cos 4x}{1 - 2\cos 3x} dx$ is equal to

A. $\sin x + \sin 2x + C$

B. $\sin x - \frac{\sin 2x}{2} + C$

C. $-\sin x - \frac{\sin 2x}{2} + C$

D. None of these

Answer: C

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Exercise Single Option Correct Type Questions

1. Let $f(x) = \int \frac{x^2 dx}{(1+x^2)\left(1+\sqrt{1+x^2}\right)}$ and $f(0) = 0$.

$f(x)$ is

A. $\log_e\left(1+\sqrt{2}\right)$

B. $\log_e\left(1+\sqrt{2}\right) - \frac{\pi}{4}$

C. $\log_e\left(1+\sqrt{2}\right) + \frac{\pi}{4}$

D. None of these

Answer: B

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2. If $\int f(x)dx = f(x)$, then $\int \{f(x)\}^2 dx$ is equal to

A. $\frac{1}{2}\{f(x)\}^2$

B. $\{f(x)\}^3$

C. $\frac{\{f(x)\}^3}{3}$

D. $\{f(x)\}^2$

Answer: A

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3. If $\int f(x)dx = F(x)$, then $\int x^3 f(x^2)dx$ is equal to :

A. $\frac{1}{2}\left[x^2\{F(x)\}^2 dx\right]$

B. $\frac{1}{2}\left[x^2 F\left(x^2\right) - \int F\left(x^2\right) d\left(x^2\right)\right]$

C. $\frac{1}{2}\left[x^2 F(x) - \frac{1}{2}\int\{F(x)\}^2 dx\right]$

D. None of the above

Answer: B

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4. If n is a positive odd integer, then $\int |x^n| dx =$

A. $\left|\frac{x^{n+1}}{n+1}\right| + C$

B. $\frac{x^{n+1}}{n+1} + C$

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

D. None of these

Answer: C

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5. Let $F(x)$ be the primitive of $\frac{3x+2}{\sqrt{x-9}}$ w.r.t. x. If $F(10)=60$, then the sum of digits of the value of $F(13)$, is ..... .

A. 66

B. 132

C. 248

D. 264

Answer: B

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6. $\int (x^x)^x (2x\log_e x + x)dx$ is equal to

A. $x^{(x^x)} + C$

B. $(x^x)^x + C$

C. $x^2.\log_e x + C$

D. None of these

Answer: B

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7. The value of $\int x \log x(\log x - 1)dx$ is equal to

A. $2(x \log x - x)^2 + C$

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

C. $(x \log x)^2 + C$

D. $\frac{1}{2}(x \log x)^3 + C$

Answer: B

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8. $\int \frac{x^2-1}{x^3\sqrt{2x^4-2x^2+1}}dx$ is equal to (a) $\frac{\sqrt{2x^4-2x^2+1}}{x^3}+C$ (b) $\frac{\sqrt{2x^4-2x^2+1}}{x}+C$ (c) $\frac{\sqrt{2x^4-2x^2+1}}{x^2}+C$ (d) $\frac{\sqrt{2x^4-2x^2+1}}{2x^2}+C$

A. $\frac{\sqrt{2x^4-2x^5+1}}{x^2}+C$

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

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

D. $\frac{\sqrt{2x^4-2x^2+1}}{2x^2}+C$

Answer: D

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9. Let $f(x)$ be a polynomial satisfying f(0)=2 , $f'(0)=3$ and $f''(x)=f(x)$ then f(4) equals

A. $\frac{5\left(e^8+1\right)}{2e^4}$

B. $\frac{5\left(e^8-1\right)}{2e^4}$

C. $\frac{2e^4}{5(e^8-1)}$

D. $\frac{2e^4}{5(e^8+1)}$

Answer: B

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10. $\int \frac{e^{(x^2+4Inx)} - x^3e^{x^2}}{x-1}dx$ equals to

A. $\left(\frac{e^{3\ln x} - e^{\ln x}}{2x}\right)e^{x^2} + C$

B. $\frac{(x-1)xe^{x^2}}{2} + C$

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

D. None of these

Answer: D

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11. $\int \tan^4 x dx = A\tan^3 x + B\tan x + f(x)$, then

A. $A = \frac{1}{3}, B = -1, f(x) = x + C$

B. $A = \frac{2}{3}, B = -1, f(x) = x + C$

C. $A = \frac{1}{3}, B = 1, f(x) = x + C$

D. $A = \frac{2}{3}, B = 1, f(x) = -x + C$

Answer: A

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12. If the anti derivative of $\int \frac{\sin^4 x}{x} dx$ is $f(x)$ then $\int \frac{\sin^4(p+q)x}{x} dx$ in terms of $f(x)$ is

A. $f\{(p+q)x\}$

B. $\frac{f\{(p+q)x\}}{p+q}$

C. $f\{(p+q)x\}(p+q)$

D. None of these

Answer: A

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13. Prove that :

$$\frac{\sin\theta}{\cos(3\theta)}+\frac{\sin(3\theta)}{\cos(9\theta)}+\frac{\sin(9\theta)}{\cos(27\theta)}=\frac{1}{2}(\tan(27\theta)-\tan(\theta))$$

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14. For $x^2 \neq n\pi+1, n \in N$(the set of natural numbers), the integral $\int x\sqrt{\frac{2\sin(x^2-1)-\sin 2(x^2-1)}{2\sin(x^2-1)+\sin 2(x^2-1)}}$dx is equal to (where c is a constant of integration)

A. $\log\left|\frac{1}{2}\sec\left(x^2+1\right)\right|+C$

B. $\log\left|\sec\left(\frac{x^2+1}{2}\right)\right|+C$

C. $\frac{1}{2}\log\left|\sec\left(x^2+1\right)\right|+C$

D. None of these

Answer: B

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

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

D. None of the above

Answer: A

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

A. $\sin x$

B. $\cos x$

C. $\tan x$

D. $\cot x$

Answer: C

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17. Evaluate $\int \frac{\sin^3 x dx}{(\cos^4 x + 3\cos^2 x + 1)\tan^{-1}(\sec x + \cos x)}$.

A. $\tan^{-1}(\sec x + \cos x) + C$

B. $\log_e \left|\tan^{-1}(\sec x + \cos x)\right| + C$

C. $\frac{1}{(\sec x + \cos x)^2} + C$

D. None of these

Answer: B

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18. The primitive of the function $f(x) = x|\cos x|$, when $\frac{\pi}{2} < x < \pi$ is given by

A. $\cos x + x \sin x + C$

B. $-\cos x - x \sin x + C$

C. $x \sin x - \cos x + C$

D. None of the above

Answer: B

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19. The primitive of the function $f(x) = (2x + 1)|\sin x|$, when $\pi < x < 2\pi$ is

A. $-(2x + 1)\cos x + 2 \sin x + C$

B. $(2x + 1)\cos x - 2 \sin x + C$

C. $\left(x^2+x\right)\cos x+C$

D. None of the above

Answer: B

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20. If $f(x)=\begin{vmatrix} 0 & x^2-\sin x & \cos x-2 \\ \sin x-x^2 & 0 & 1-2x \\ 2-\cos x & 2x-1 & 0 \end{vmatrix}$, then $\int f(x)dx$ is equal to

A. $\frac{x^3}{3}-x^2\sin x+\sin 2x+C$

B. $\frac{x^3}{3}-x^2\sin x-\cos 2x+C$

C. $\frac{x^3}{3}-x^2\cos x-\cos 2x+C$

D. None of the above

Answer: D

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Exercise More Than One Correct Option Type Questions

1. $\int \frac{dx}{(x+1)(x-2)} = A\log(x+1) + B\log(x-2) + C$, where

A. $A + B = 0$

B. $AB = 0$

C. $A/B = -1$

D. None of these

Answer: A::C

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2. If $\int \frac{1}{(x^2+1)(x^2+4)}dx = A\tan^{-1}x + B\ \tan^{-1}\frac{x}{2} + C$, then

A. A=1/3

B. A= -1/3

C. B= 1/6

D. B= -1/6

Answer: A::D

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3. If $\int x \log\left(1+x^2\right) dx = \phi(x)\log\left(1+x^2\right) + x(\Psi) + C$, then

A. $\phi(x) = \frac{1+x^2}{2}$

B. $\Psi(x) = \frac{1+x^2}{2}$

C. $\Psi(x) = -\frac{1+x^2}{2}$

D. $\phi(x) = -\frac{1+x^2}{2}$

Answer: A::C

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

A. $A = \frac{3}{2}$

B. $B = \frac{35}{36}$

C. C is indefinite

D. $A + B = -\frac{19}{36}$

Answer: B::C::D

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5. If $\int \tan^5 x ex = A\tan^4 x + B\tan^x + g(x) + C$, where C is constant of integration and $g(0) = 0,$ then

A. $A = \frac{1}{4}, B = -\frac{1}{2}$

B. $g(x) = \ln|\sec x|$

C. $g(x) = \ln|\cos x|$

D. $A = -\frac{1}{4}, B = \frac{1}{3}$

Answer: A::B

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Exercise Statement I And Ii Type Questions

1. Statement I Integral of an even function is not always an odd function.

Statement II Integral of an odd function is an even function .

A. Statement I is true, Statement II is also true , Statement II is the correct explanation of Statement I.

B. Statement I is true, Statement II is also true, Statement II is not the correct explanation of Statement I.

C. Statement I is true, Statement II is false.

D. Statement I is false, Statement II is true .

Answer: C

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2. Statement I If $a > 0$ and $b^2 - 4ac < 0$, then the value of the integral $\int \frac{dx}{ax^2 + bx + c}$ will be of the type $\mu \tan^{-1}. \frac{x + A}{B} + C$, where A, B, C, μ are constants.

Statement II If $a > 0, b^2 - 4ac < 0$, then $ax^2 + bx + C$ can be written as sum of two squares .

A. (a)Statement I is true, Statement II is also true , Statement II is the correct explanation of Statement I.

B. (b)Statement I is true, Statement II is also true, Statement II is not the correct explanation of Statement I.

C. (c)Statement I is true, Statement II is false.

D. (d)Statement I is false, Statement II is true .

Answer: A

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3. Statement I $\int\left(\frac{1}{1+x^4}\right)dx = \tan^{-1}\left(x^2\right) + C$

Statement II $\int\frac{1}{1+x^2}dx = \tan^{-1}x + C$

A. Statement I is true, Statement II is also true , Statement II is the correct explanation of Statement I.

B. Statement I is true, Statement II is also true, Statement II is not the correct explanation of Statement I.

C. Statement I is true, Statement II is false.

D. Statement I is false, Statement II is true .

Answer: D

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4. Statement I $\int 2^{\tan^{-1}x} d\left(\cot^{-1}x\right) = \frac{2^{\tan^{-1}x}}{\ln 2} + C$

Statement II $\frac{d}{dx}(a^x + C) = a^x \ln a$

A. Statement I is true, Statement II is also true , Statement II is the correct explanation of Statement I.

B. Statement I is true, Statement II is also true, Statement II is not the correct explanation of Statement I.

C. Statement I is true, Statement II is false.

D. Statement I is false, Statement II is true .

Answer: D

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Exercise Passage Based Questions

1. Let us consider the integral of the following forms

$$f\left(x_1, \sqrt{mx^2+nx+p}\right)^{1/2}$$

Case I If $m > 0$, then put $\sqrt{mx^2+nx+C} = u \pm x\sqrt{m}$

Case II If $p > 0$, then put $\sqrt{mx^2+nx+C} = ux \pm \sqrt{p}$

Case III If quadratic equation $mx^2+nx+p=0$ has real roots α and β

there put $\sqrt{mx^2+nx+p} = (x-\alpha)u$ or $(x-\beta)u$

$$\int \frac{\left(x+\sqrt{1+x^2}\right)^{15}}{\sqrt{1+x^2}} dx \text{ is equal to}$$

A. $\sqrt{9x^2+4x+6} = u \pm 3x$

B. $\sqrt{9x^2+4x+6} = 3u \pm x$

C. $x = \frac{1}{t}$

D. $9x^2+4x+6 = \frac{1}{t}$

Answer: A

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2. Let us consider the integral of the following forms

$$f\left(x_1, \sqrt{mx^2+nx+p}\right)^{1/2}$$

Case I If $m > 0$, then put $\sqrt{mx^2+nx+C} = u \pm x\sqrt{m}$

Case II If $p > 0$, then put $\sqrt{mx^2+nx+C} = ux \pm \sqrt{p}$

Case III If quadratic equation $mx^2+nx+p=0$ has real roots α and β

there put $\sqrt{mx^2+nx+p} = (x-\alpha)u$ or $(x-\beta)u$

$$\int \frac{\left(x+\sqrt{1+x^2}\right)^{15}}{\sqrt{1+x^2}} dx \text{ is equal to}$$

A. A. $\frac{\left(x+\sqrt{1+x^2}\right)^{16}}{10} + C$

B. B. $\frac{1}{15\left(\sqrt{1+x^2+x}\right)} + C$

C. C. $\frac{15}{\left(\sqrt{1+x^2}-x\right)} + C$

D. D. $\frac{\left(x+\sqrt{1+x^2}\right)^{15}}{15} + C$

Answer: D

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3. Let us consider the integral of the following forms

$$f\left(x_1, \sqrt{mx^2+nx+p}\right)^{1/2}$$

Case I If $m > 0$, then put $\sqrt{mx^2+nx+C} = u \pm x\sqrt{m}$

Case II If $p > 0$, then put $\sqrt{mx^2+nx+C} = ux \pm \sqrt{p}$

Case III If quadratic equation $mx^2+nx+p=0$ has real roots α and β there put $\sqrt{mx^2+nx+p} = (x-\alpha)u$ or $(x-\beta)u$

To evaluate $\int \frac{dx}{(x-1)\sqrt{-x^2+3x-2}}$ one of the most suitable substitution could be

A. (a) $\sqrt{-x^2+3x-2} = u$

B. (b) $\sqrt{-x^2+3x-2} = \left(ux\sqrt{2}\right)$

C. (c) $\sqrt{-x^2+3x-2} = u(1-x)$

D. (d) $\sqrt{-x^2+3x-2} = u(x+2)$

Answer: C

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4. Let $I_{m,n} = \int \sin^n x \cos^m x dx$. Then , we can relate $I_{n,m}$ with each of the following :

(i) $I_{n-2,m}$ $(ii) I_{n+2,m}$

(iii) $I_{n,m-2}$ $(iv) I_{n,m+2}$

(v) $I_{n-2,m+2}$ $I_{n+2,m-2}$

Suppose we want to establish a relation between $I_{n,m}$ and $I_{n,m-2}$, then we get

$P(x) = \sin^{n+1} x \cos^{m-1} x$ ...(i)

In $I_{n,m}$ and $I_{n,m-2}$ the exponent of cos x in m and $m-2$ respectively, the minimum of the two is m - 2, adding 1 to the minimum we get $m-2+1 = m-1$. Now, choose the exponent of sin x for m - 1 of cos x in P(x). Similarly, choose the exponent of sin x for

$P(x) = (nH)\sin^n x \cos^m x - (m-1)\sin^{n+2} x \cos^{m-2} x.$

Now, differentiating both the sides of Eq. (i), we get

$= (n+1)\sin^n x \cos^m x - (m-1)\sin^n x\left(1-\cos^2 x\right)\cos^{m-2} x$

$= (n+1)\sin^n x \cos^m x - (m-1)\sin^n x \cos^{m-2} x + (m-1)\sin^n x \cos^n x$

$= (n+m)\sin^n x \cos^m x - (m-1)\sin^n x \cos^{m-2} x$

Now, integrating both the sides, we get

$\sin^{n+1} x \cos^{m-1} x = (n+m)I_{n,m} - (m-1)I_{n,m-2}$

Similarly, we can establish the other relations.

The relation between $I_{4,2}$ and $I_{2,2}$ is

A. $I_{4,2} = \frac{1}{6}(-\sin^3 x \cos^3 x + 3I_{2,2})$

B. $I_{4,2} = \frac{1}{6}(\sin^3 x \cos^3 x + 3I_{2,2})$

C. $I_{4,2} = \frac{1}{6}(\sin^3 x \cos^3 x - 3I_{2,2})$

D. $I_{4,2} = \frac{1}{4}(-\sin^3 x \cos^3 x + 2I_{2,2})$

Answer: A

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5. Let $I_{m,n} = \int \sin^n x \cos^m x dx$. Then , we can relate $I_{n,m}$ with each of the following :

(i) $I_{n-2,m}$ $(ii) I_{n+2,m}$

(iii) $I_{n,m-2}$ $(iv) I_{n,m+2}$

(v) $I_{n-2,m+2}$ $I_{n+2,m-2}$

Suppose we want to establish a relation between $I_{n,m}$ and $I_{n,m-2}$, then

we get

$P(x) = \sin^{n+1} x \cos^{m-1} x$ ...(i)

In $I_{n,m}$ and $I_{n,m-2}$ the exponent of cos x in m and $m-2$ respectively, the minimum of the two is m - 2, adding 1 to the minimum we get $m-2+1 = m-1$. Now, choose the exponent of sin x for m - 1 of cos x in P(x). Similarly, choose the exponent of sin x for

$P(x) = (nH)\sin^n x \cos^m x - (m-1)\sin^{n+2} x \cos^{m-2} x.$

Now, differentiating both the sides of Eq. (i), we get

$= (n+1)\sin^n x \cos^m x - (m-1)\sin^n x\left(1-\cos^2 x\right)\cos^{m-2} x$

$= (n+1)\sin^n x \cos^m x - (m-1)\sin^n x \cos^{m-2} x + (m-1)\sin^n x \cos^n x$

$= (n+m)\sin^n x \cos^m x - (m-1)\sin^n x \cos^{m-2} x$

Now, integrating both the sides, we get

$\sin^{n+1} x \cos^{m-1} x = (n+m)I_{n,m} - (m-1)I_{n,m-2}$

Similarly, we can establish the other relations.

The relation between $I_{4,2}$ and $I_{6,2}$ is

A. $I_{4,2} = \frac{1}{5}\left(\sin^3 x \cos^3 x + 8I_{6,2}\right)$

B. $I_{4,2} = \frac{1}{5}\left(-\sin^3 x \cos^3 x + 8I_{6,2}\right)$

C. $I_{4,2} = \frac{1}{5}\left(\sin^3 x \cos^3 x - 8I_{6,2}\right)$

D. $I_{4,2} = \frac{1}{6}\left(\sin^3 x \cos^3 x + 8I_{6,2}\right)$

Answer: A

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6. Let $I_{m,n} = \int \sin^n x \cos^m x dx$. Then , we can relate $I_{n,m}$ with each of the following :

(i) $I_{n-2,m}$ $(ii) I_{n+2,m}$

(iii) $I_{n,m-2}$ $(iv) I_{n,m+2}$

(v) $I_{n-2,m+2}$ $I_{n+2,m-2}$

Suppose we want to establish a relation between $I_{n,m}$ and $I_{n,m-2}$, then we get

$P(x) = \sin^{n+1} x \cos^{m-1} x$ ...(i)

In $I_{n,m}$ and $I_{n,m-2}$ the exponent of cos x in m and $m-2$ respectively, the minimum of the two is m - 2, adding 1 to the minimum we get $m-2+1 = m-1$. Now, choose the exponent of sin x for m - 1 of cos x in P(x). Similarly, choose the exponent of sin x for

$P(x) = (nH)\sin^n x \cos^m x - (m-1)\sin^{n+2} x \cos^{m-2} x.$

Now, differentiating both the sides of Eq. (i), we get

$$= (n+1)\sin^n x \cos^m x - (m-1)\sin^n x\left(1-\cos^2 x\right)\cos^{m-2} x$$

$$= (n+1)\sin^n x \cos^m x - (m-1)\sin^n x \cos^{m-2} x + (m-1)\sin^n x \cos^n x$$

$$= (n+m)\sin^n x \cos^m x - (m-1)\sin^n x \cos^{m-2} x$$

Now, integrating both the sides, we get

$$\sin^{n+1} x \cos^{m-1} x = (n+m)I_{n,m} - (m-1)I_{n,m-2}$$

Similarly, we can establish the other relations.

The relation $I_{4,2}$ and $I_{4,4}$ is

A. $I_{4,2} = \frac{1}{3}\left(\sin^5 x \cos^3 x + 8I_{4,4}\right)$

B. $I_{4,2} = \frac{1}{3}\left(-\sin^5 x \cos^3 x + 8I_{4,4}\right)$

C. $I_{4,2} = \frac{1}{3}\left(\sin^5 x \cos^3 x - 8I_{4,4}\right)$

D. $I_{4,2} = \frac{1}{3}\left(\sin^5 x \cos^3 x + 6I_{4,4}\right)$

Answer: B

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7. If $f: R \to (0, \infty)$be a differentiable function $f(x)$ satisfying

$f(x+y) - f(x-y) = f(x) \cdot \{f(y) - f(-y)\}, \forall x, y \in R, (f(y) \neq f($ −

and $f'(0) = 2010.$

Now, answer the following questions.

Which of the following is true for $f(x)$

A. $f(x)$ is one-one and into

B. $\{f(x)\}$ is non-periodic, where $\{\cdot\}$ denotes fractional part of x.

C. $f(x) = 4$ has only two solutions.

D. $f(x) = f^{-1}(x)$ has only one solution .

Answer: B

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8. If $f: R \to (0, \infty)$be a differentiable function $f(x)$ satisfying

$f(x+y) - f(x-y) = f(x) \cdot \{f(y) - f(y) - y\}, \forall x, y \in R, (f(y) \neq f($ −

and $f'(0) = 2010.$

Now, answer the following questions.

let $g(x) = \log_e(\sin x)$, and $\int f(g(x))\cos x dx = h(x) + c$, (where c is constant of integration), then $h\left(\frac{\pi}{2}\right)$ is equal to

A. 0

B. $\frac{1}{2010}$

C. 1

D. $\frac{1}{2011}$

Answer: D

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9. Let $f: R \to R$ be a function as

$f(x) = (x-1)(x+2)(x-3)(x-6) - 100$. If $g(x)$ is a polynomial of degree ≤ 3 such that $\int \frac{g(x)}{f(x)} dx$ does not contain any logarithm function and $g(-2) = 10$. Then

The equation $f(x) = 0$ has

A. all four distinct roots

B. three distinct real roots

C. two real and two imaginary

D. all four imaginary roots

Answer: C

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10. Let $f: R \to R$ be a function as

$f(x) = (x-1)(x+2)(x-3)(x-6) - 100$. If $g(x)$ is a polynomial of degree ≤ 3 such that $\int \frac{g(x)}{f(x)} dx$ does not contain any logarithm function and $g(-2) = 10$. Then

The equation $f(x) = 0$ has

A. -136

B. -100

C. -84

D. -68

Answer: C

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11. Let $f: R \to R$ be a function as $f(x) = (x-1)(x+2)(x-3)(x-6) - 100$. If $g(x)$ is a polynomial of degree ≤ 3 such that $\int \frac{g(x)}{f(x)} dx$ does not contain any logarithm function and $g(-2) = 10$. Then $\int \frac{g(x)}{f(x)} dx$, equals

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

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

C. $\tan^{-1}(x) + c$

D. None of these

Answer: A

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Exercise Single Integer Answer Type Questions

1. 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 of $ax^2 + bx + c$, then the value of f(1) is

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2. Let F(x) be the primitive of $\frac{3x+2}{\sqrt{x-9}}$ w.r.t.x. If $F(10) = 60$ then the value of $F(13)$

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3. Let $u(x) and v(x)$ be differentiable functions such that $\frac{u(x)}{v(x)} = 7. \frac{u'(x)}{v'(x)} = p and \left(\frac{u(x)}{v(x)}\right)' = q, then \frac{p+q}{p-q}$ has the value of to 1 (b) 0 (c) 7 (d) -7

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4. If $\int \frac{1}{(x^2-1)} \ln\left(\frac{x-1}{x+1}\right) dx = 6A\left[\ln\left(\frac{x-1}{x+1}\right)\right]^2 + C$, then find 24 A.

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5. If $\int \frac{e^x\left(2-x^2\right)}{(1-x)\sqrt{1-x^2}} dx = \mu e^x \left(\frac{1+x}{1-x}\right)^\lambda + C$, then $2(\lambda+\mu)$ is equal to ..... .

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

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7. Suppose $A = \int \frac{dx}{x^2 + 6x + 25}$ and $B = \int \frac{dx}{x^2 - 6x - 27}$.

If $12(A + B) = \lambda \cdot \tan^{-1}\left(\frac{x+3}{4}\right) + \mu \cdot \ln\left|\frac{x-9}{x+3}\right| + C$, then the value of $(\lambda + \mu)$ is ... .

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8. If $\int \frac{\cos 6x + \cos 9x}{1 - 2\cos 5x} dx = -\frac{\sin 4x}{k} - \sin x + C$, then the value of k is ..... .

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9. The value of $\int \frac{\tan x}{\tan^2 x + \tan x + 1} dx = x - \frac{2}{\sqrt{A}} \tan^{-1}\left(\frac{2\tan x + 1}{\sqrt{A}}\right) + C$ Then the value of A is:

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10. $\int \sin^{5/2} x \cos^3 x dx = 2\sin^{A/2} x \left[\frac{1}{B} - \frac{1}{C}\sin^2 x\right] + D$, then the value of $(A+B)-C$ is equal to ..... .

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11. If $\int \left(x^{2020} + x^{804} + x^{402}\right)\left(2x^{1608} + 5x^{402} + 10\right)^{1/402} dx = \frac{1}{10a}\left(2x^{2010} + 5x^{80}\right.$. Then $(a-400)$ is equal to .....

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12. If $\int e^{x^3+x^2-1}\left(3x^4 + 2x^3 + 2x\right)dx = f(x) + C$, then the value of $f(1) \times$

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Exercise Subjective Type Questions

1. The value of

$$\int e^{(x\sin x+\cos x)}\cdot\left(\frac{x^4\cos^3 x-x\sin x+\cos x}{x^2\cos^2 x}\right)dx, \text{ is equal to}$$

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2. Evaluate : $\int\sqrt{x+\sqrt{x^2+2}}dx$

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3. Evaluate $\int\frac{dx}{\left(\sqrt{(x-\alpha)^2-\beta^2}\right)(ax+b)}$.

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4. Evaluate $\int\frac{\sqrt{1+\sqrt[3]{x}}}{\sqrt[3]{x^2}}dx$.

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5. Evaluate: $\int \frac{\sin^3\left(\frac{\theta}{2}\right)}{\cos\left(\frac{\theta}{2}\right)\sqrt{\cos^3\theta+\cos^2\theta+\cos\theta}}d\theta$

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6. Evaluate $\int \frac{(2\sin\theta+\sin 2\theta)d\theta}{(\cos\theta-1)\sqrt{\cos\theta+\cos^2\theta+\cos^3\theta}}.$

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7. Connect $\int x^{m-1}(a+bx^n)^p dx$ with $\int x^{m-n-1}(a+bx^n)^p dx$ and evaluate $\int \frac{x^8 dx}{(1-x^3)^{1/3}}.$

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8. Evaluate $\int \cos ec^2 x \ln\left(\cos x+\sqrt{\cos 2x}\right)dx.$

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9. Evaluate $\int \frac{dx}{(\sin x + a\sec x)^2}$ when $|a| > \frac{1}{2}$.

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10. Evaluate $\int \frac{dx}{x - \sqrt{x^2 + 2x + 4}}$.

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11. Evaluate $\int \frac{dx}{\sqrt{x^2 + 2x + 2}}$.

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12. Evaluate: $\int \frac{x^4 + 1}{x^6 + 1} dx$

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13. Evaluate: $\int \frac{\left[\sqrt{1+x^2}+x\right]^n}{\sqrt{1+x^2}} dx$

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14. If $y^2 = ax^2 + 2bx + c$ and $u_n = \int \frac{x^n}{y} dx$, prove that $(n+1)au_{n+1} + (2n+1)bu_n + (n)cu_{n-1} = x^n y$ and deduce that $au_1 = y - bu_0, 2a^2 u_2 = y(ax - 3b) - (ac - 3b^2)u_0$.

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Exercise Questions Asked In Previous 13 Years Exam

1. The integral $\int \frac{\sec^2 x}{(\sec x + \tan x)^{\frac{9}{2}}} dx$ equals (for some arbitrary constant K).

$-\frac{1}{(\sec x + \tan x)^{\frac{11}{2}}}\left\{\frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

$\frac{1}{(\sec x + \tan x)^{\frac{1}{11}}}\left\{\frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

$$-\frac{1}{(\sec x+\tan x)^{\frac{11}{2}}}\left\{\frac{1}{11}+\frac{1}{7}(\sec x+\tan x)^2\right\}+K$$

$$\frac{1}{(\sec x+\tan x)^{\frac{11}{2}}}\left\{\frac{1}{11}+\frac{1}{7}(\sec x+\tan x)^2\right\}+K$$

A. $\frac{-1}{(\sec x+\tan x)^{11/2}}\left\{\frac{1}{11}-\frac{1}{7}(\sec x+\tan x)^2\right\}+K$

B. $\frac{1}{(\sec x+\tan x)^{11/2}}\left\{\frac{1}{11}-\frac{1}{7}(\sec x+\tan x)^2\right\}+K$

C. $\frac{-1}{(\sec x+\tan x)^{11/2}}\left\{\frac{1}{11}+\frac{1}{7}(\sec x+\tan x)^2\right\}+K$

D. $\frac{1}{(\sec x+\tan x)^{11/2}}\left\{\frac{1}{11}+\frac{1}{7}(\sec x+\tan x)^2\right\}+K$

Answer: C

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2. If $I=\int\frac{e^x}{e^{4x}+e^{2x}+1}dx.\ J=\int\frac{e^{-x}}{e^{-4x}+e^{-2x}+1}dx.$ Then for an arbitrary constant c, the value of $J-I$ equal to

A. $\frac{1}{2}\log\left|\frac{e^{4x}-e^{2x}+1}{e^{4x}+e^{2x}+1}\right|+C$

B. $\frac{1}{2}\log\left|\frac{e^{2x}+e^x+1}{e^{2x}-e^x+1}\right|+C$

C. $\frac{1}{2}\log\left|\frac{e^{2x}-e^x+1}{e^{2x}+e^x+1}\right|+C$

D. $\frac{1}{2}\log\left|\frac{e^{4x}+e^{2x}+1}{e^{4x}-e^{2x}+1}\right|+C$

Answer: C

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3. The integral $\int\frac{2x^{12}+5x^9}{\left(x^5+x^3+1\right)^3}dx$ is equal to (where C is a constant of integration)

A. $\frac{-x^5}{\left(x^5+x^3+1\right)^2}+C$

B. $\frac{x^{10}}{2\left(x^5+x^3+1\right)^2}+C$

C. $\frac{x^5}{2\left(x^5+x^3+1\right)^2}+C$

D. $\frac{-x^{10}}{2\left(x^5+x^3+1\right)^2}+C$

Answer: B

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

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

B. $(x^4+1)^{1/4} + C$

C. $-(x^4+1)^{\frac{1}{4}} + C$

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

Answer: D

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5. The integral $\int \left(1 + x - \frac{1}{x}\right) e^{x+\frac{1}{x}} dx$ is equal to

A. $(x-1)e^{x+\frac{1}{x}} + C$

B. $xe^{x+\frac{1}{x}} + C$

C. $(x+1)e^{x+\frac{1}{x}} + C$

D. $-xe^{x+\frac{1}{x}} + C$

Answer: B

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6. If $\int f(x)dx = \Psi(x)$, then $\int x^5 f(x)^3 dx$ is equal to

A. $\frac{1}{3}\left[x^3\Psi\left(x^3\right) - \int x^2\Psi\left(x^3\right)dx\right] + C$

B. $\frac{1}{3}x^3\Psi\left(x^3\right) - 3\int x^3\Psi\left(x^3\right)dx + C$

C. $\frac{1}{2}x^3\Psi\left(x^3\right) - \int x^2\Psi\left(x^3\right)dx + C$

D. $\frac{1}{3}\left[x^3\Psi\left(x^3\right) - \int x^3\Psi\left(x^3\right)dx\right] + C$

Answer: C

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7. If the integral $\int \frac{5\tan x}{\tan x - 2}dx = x + a\ln|\sin x - 2\cos x| + k$ then a is equal to (1) -1 (2) -2 (3) 1 (4) 2

A. -1

B. -2

C. 1

D. 2

Answer: D

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8. The value of $\sqrt{2}\int \frac{\sin x}{\sin\left(x-\frac{\pi}{4}\right)}dx$, is

A. $x+\log\left|\cos\left(x-\frac{\pi}{4}\right)\right|+C$

B. $x+\log\left|\sin\left(x-\frac{\pi}{4}\right)\right|+C$

C. $x-\log\left|\sin\left(x-\frac{\pi}{4}\right)\right|+C$

D. $x-\log\left|\cos\left(x-\frac{\pi}{4}\right)\right|+C$

Answer: B

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