MATHS

BOOKS - ARIHANT MATHS

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. Evaluate the following integrals : $\int \frac{\sin^6 x + \cos^6 x}{\sin^2 x \cos^2 x} dx$

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8. Integrate $\int \frac{\cos x - \cos 2x}{1 - \cos x}$

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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. Express the following in exponential form

2 × 2× 3 × 3 × 3 × 7 × 7

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17. Express the following in exponential form

4 × 6 × 6 × 6 × 8 × 8

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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 $\int\left(\frac{3\sin x+4\cos x}{4\sin x-3\cos x}\right)dx$

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30. Evaluate the following integrals : $\int \frac{e^{m\tan^{-1}x}}{1+x^2}$

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

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32. Evaluate $\int \cos 4x \cos 7x dx$

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

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

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

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

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

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38. Evaluate $\int \frac{\sec 2x - 1}{\sec 2x + 1} dx$

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

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

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

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

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43. Evaluate: $\int \sqrt{2x^2 + 3x + 4}\, dx$

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

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45. $\int \frac{2x}{\sqrt{1-x^2-x^4}}dx =$

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46. Evaluate $\int \frac{a^x}{\sqrt{1-a^{2x}}}dx$

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

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

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49. Express the following in exponential form :

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

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

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

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53. Simplify : $4^2 \times 3^2$

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54. Find the following product

5 × (-2) × (-4)

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55. Find the value of $11^2 + 12^2 + \ldots . + 20^2$

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56. Express the following in exponential form :

4 × 4 × 9 × 9 ×9 × 9

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

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

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59. Evaluate: $\int \frac{1}{\sin x + \cos x} dx$

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60. Evaluate $\int \frac{dx}{\sqrt{3}\sin x + \cos x}$

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61. Evaluate $\int \frac{dx}{\sqrt{3}\sin x + \cos x}$

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62. Evaluate $\int (2 + 3\cos x) dx.$

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63. 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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64. 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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65. Evaluate $\int \sin^{-1} x dx.$

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

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

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68. Evaluate : $\int x^2 \cos x dx$.

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69. Find x , if $\frac{13^3 + 7^3}{13^2 + 7^2 - x} = 20$

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

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71. Find x , if $4^2 + 3^2 - x = 20$

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

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

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

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

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76. 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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77. 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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78. 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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79. Solve $\left(\frac{4}{13}\right)^4 . \left(\frac{13}{7}\right)^2 . \left(\frac{7}{4}\right)^3$

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80. If $\int (\sin 3\theta + \sin\theta)\cos\theta e^{\sin\theta} d\theta =$

$\left(A\sin^3\theta + B\cos^2\theta + C\sin\theta + D\cos\theta + E\right)e^{\sin\theta} + F,$ 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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81. $\int e^{x\sin x+\cos x}\left(\frac{x^4\cos^3 x - x\sin x+\cos x}{x^2\cos^2 x}\right)dx =$

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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82. $\int \sin^{-1}\left(\frac{2x+2}{\sqrt{4x^2+8x+13}}\right)dx$ is,

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

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

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

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

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87. Find the partial fraction

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

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

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

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

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

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

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

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

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

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96. Solve $\int \frac{1 + x \cos x}{x(1 - x^2 e^{2\sin x})} dx.$

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97. $\int \frac{1}{x}\left\{\log e^{ex} \cdot \log e^{e^2 x} \cdot \log e^{e^3 x}\right\} dx$

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98. Find the value of $\int \frac{d(x^2+1)}{\sqrt{(x^2+2)}}$.

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

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

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

D. None of these

Answer: A

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

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101. For any natural number m, evaulate,

$$\int \left(x^{3m}+x^{2m}+x^{m}\right)\left(2x^{2m}+3x^{m}\right)+6^{\frac{1}{m}}dx,\ x>0$$

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102. $\int \frac{x}{\sqrt{1+x^2+\sqrt{(1+x^2)^3}}}dx$ 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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103. 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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104. $\int \frac{px^{p+2q-1}-qx^{q-1}}{x^{2p+2q}+2x^{p+q}+1}dx$ 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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105. Solve : $x - \frac{x-1}{2} = 1 - \frac{x-2}{3}$

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

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

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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107. If $f(x) = (a - x^n)^{1/n}$ prove that $f(f(x)) = x$

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

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

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

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

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112. The value of $\int \frac{(ax^2 - b)dx}{x\sqrt{c^2x^2 - (ax^2 + b)^2}}$ is equal to

A. $\frac{1}{c}\sin^{-1}\left(ax\frac{b}{x}\right) + k$

B. $c\sin^{-1}\left(ax + \frac{b}{x}\right) + k$

C. $\sin^{-1}\left[\frac{ax + b/x}{c}\right] + k$

D. None of these

Answer: C

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

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

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115. 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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116. 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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117. Evaluate $\int \frac{1}{(x+1)\sqrt{x-2}} dx.$

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

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

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

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121. Evaluate: $\int \frac{x^3+x^2+2x+1}{x^2-x+1}dx$

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

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123. Evaluate the following integral

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

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

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

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

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

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

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130. Evaluate $\int \sqrt{x}\left(1+x^{1/3}\right)^4 dx.$

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

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

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

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

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

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

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137. Derive reduction formula for

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

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

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

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

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141. Evaluate: $\int \frac{1}{\cos^6 x + \sin^6 x}\, dx$

A. $\tan^{-1}(2\cot 2x) + C$

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

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

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

Answer: D

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

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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143. 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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144. 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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145. If $I_n=\int\cot^n x dx$, then $I_0+I_1+2(I_2+I_3+\ldots+I_8)+I_9+I_{10}$ equals to (where $u=\cot x$)

A. $u+\frac{u^2}{2}+\ldots+\frac{u^9}{9}$

B. $-\left(u+\frac{u^2}{2}+\ldots+\frac{u^9}{9}\right)$

C. $-\left(u+\frac{u^2}{2!}+\ldots+\frac{u^9}{9!}\right)$

D. $\frac{u}{2}+\frac{2u^2}{3}+\ldots+\frac{9u^9}{10}$

Answer: B

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146. 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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147. $\int_a^b \frac{1}{\left(\sqrt{(x-a)(b-x)}\right)} dx, b > a$

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

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

A. $-\frac{1}{2\sqrt{3}}\log\left|\frac{\sqrt{x^4+x^2+1}-\sqrt{3}x}{\sqrt{x^4+x^2+1}+\sqrt{3}x}\right|+C$

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

C. $\frac{1}{2\sqrt{3}}\log\left|\frac{\sqrt{x^4-x^2+1}-\sqrt{3}x}{\sqrt{x^4+x^2+1}+\sqrt{3}x}\right|+C$

D. None of the above

Answer: A

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

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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151. Find x , if $\frac{3x}{2}+\frac{2x}{3}-\frac{5x}{4}=7$

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152. If $\int\frac{dx}{(x^2+a^2)^2}=\frac{1}{ka^2}\left\{\frac{x}{x^2+a^2}+\frac{1}{a}\tan^{-1}.\frac{x}{a}\right\}+C$. Then the value of k, is

A. 1

B. 2

C. 3

D. 4

Answer: B

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153. Find x , if $\frac{x}{2}+\frac{x}{3}-4=0$

Watch Video Solution

154. 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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155. 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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156. 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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157. 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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158. 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

Watch Video Solution

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

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

B. $B = 1$

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

D. $B = -1$

Answer: A::B

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

Watch Video Solution

162. Evalualte : $\int\left(\sqrt{\tan x}+\sqrt{\cot x}\right)dx.$

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

Watch Video Solution

163. Solve : $\frac{3x+1}{2}-\frac{x-3}{6}=\frac{2x+6}{3}$

Watch Video Solution

164. The value of $\int \frac{(x-1)}{(x+1)\sqrt{x^3+x^2+x}}dx$, is

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

Watch Video Solution

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

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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166. 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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167. 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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168. $\int \sin(101x)\sin^{99} x\,dx = \dfrac{\sin(100x)(\sin x)^{\lambda}}{\mu}$ then $\dfrac{\lambda}{\mu}$

A.

B.

C.

D.

Answer: 1

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

A.

B.

C.

D.

Answer:

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170. 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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171. 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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172. 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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173. $\int \frac{\tan\left(\frac{\pi}{4} - x\right)}{\cos^2 x \sqrt{\tan^3 x + \tan^2 x + \tan x}} dx$

A.

B.

C.

D.

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

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

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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176. 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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177. Evaluate $\int x^2 \log(1-x^2) dx$, and hence prove that $\frac{1}{1.5} + \frac{1}{2.7} + \frac{1}{3.9} + \ldots = \frac{2}{3}\log 2 - \frac{8}{9}.$

A.

B.

C.

D.

Answer: $\frac{2}{3}\log(2) - \frac{8}{9}$

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178. $\int \frac{a + b\sin x}{(b + a\sin x)^2} dx$

A.

B.

C.

D.

Answer: $-\left(\frac{\cos x}{b + a\sin x}\right) + C$

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179. 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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Solved Examples Matching Type Questions

1. Solve : $\frac{6-x}{x^2-4}=2+\frac{2}{x+2}$

A.

B.

C.

D.

Answer:

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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

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

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

Watch Video Solution

8. Evaluate the following integration

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

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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. Solve : $\frac{2y+5}{3} = 3y - 10$

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

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4. Solve the following integration

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

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5. Solve the following integration

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

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6. integrate $\int\frac{\cos 2x-\cos 2\alpha}{\cos x-\cos\alpha}dx$

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7. Find the integrals of the function: $\frac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x}$

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8. Evaluate $\int \sec^2 x \cdot \operatorname{cosec}^2 x dx$

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9. Solve the following integration

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

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10. Evaluate the following integrals : $\int \frac{\sin^6 x + \cos^6 x}{\sin^2 x \cos^2 x} dx$

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

Watch Video Solution

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 equation : $4x+\frac{1}{2}=\frac{9}{2}$

Watch Video Solution

15. Solve the following equation : $\frac{5x}{2}+3=13$

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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. Solve the following equation : $\frac{15x}{x - 11} = 4$

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

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7. Evaluate the following integrals

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

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8. Solve : $\frac{x}{4}+\frac{3}{2}=-\frac{5}{2}$

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

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10. Solve the following equation : $\frac{x-8}{5}=\frac{x-12}{9}$

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11. Evaluate the following integrals :

$\int_0^1 |3x-1|dx$

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12. Solve : $\frac{x+1}{x} - \frac{x}{x+1} = \frac{3}{2}$

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13. Evaluate the following integrals

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

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14. Evaluate the following integrals

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

Watch Video Solution

15. Solve for x : $\frac{x+2}{4+x} = \frac{5}{9}$

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16. Solve : $\frac{1}{x-2}+\frac{2}{x-1}=\frac{6}{x}$

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

Watch Video Solution

18. Evaluate the following integrals

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

Watch Video Solution

19. Evaluae $\int \frac{e^x}{\sqrt{5-4e^x-e^{2x}}}dx$

Watch Video Solution

20. Evaluate the following integrals

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

Watch Video Solution

21. Evaluate $\int \left(\frac{3 \sin x + 4 \cos x}{4 \sin x - 3 \cos x} \right) dx$

Watch Video Solution

22. Solve : $\frac{x}{3} + 2 = \frac{7}{15}$

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23. Evaluate $\int \frac{2x^2 + 5x + 9}{(x+1)\sqrt{x^2 + x + 1}} dx.$

Watch Video Solution

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

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

D. None of these

Answer: C

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Exercise For Session 4

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

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2. Evaluate the following integrals:

$\int x^2 \sin x dx$

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3. Evaluate $\int \log x dx$

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

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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. Solve : $\frac{x+1}{4} = \frac{x-2}{3}$

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

21. Solve the following linear equation : $\frac{3y+4}{2-6y} = -\frac{2}{5}$

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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. Integrate the function: $\frac{\sqrt{x^2+1}\left[\log\left(x^2+1\right) - 2\log x\right]}{x^4}$

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

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

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

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5. Evaluate the following Integrals :

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

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6. Solve the following equation : $5x + \frac{9}{2} = \frac{11}{2}$

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7. State wheter is true of false: $\int \frac{\sin^2 x}{1 + \cos x} dx = x - \sin x + C$

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8. Find the value of x , if $\frac{x}{5} + 1 = \frac{1}{15}$

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9. Solve the following linear equation : $\frac{y + 5}{y - 3} = -\frac{2}{3}$

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

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2. Solve for the value of x : $\frac{2x - 4}{x + 7} = \frac{5}{7}$

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3. Solve : $\frac{x + 5}{3} + \frac{x - 4}{2} = 2x$

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

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

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6. The value of $\int \{\{[x]\}\}dx$, where $\{.\}$ and $[.]$ denotes fractional part of x and greatest integar function, is equal to

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

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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 $f(0) = 0$.

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

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 integer, then find $\int x^n dx$

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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. $\int[\sin(ax+b)\cos(ax+b)]dx$ is equal to

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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. Find $\int(x^4+x^2)dx$

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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 : $\sin(9-\theta) = \cos(81+\theta)$

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

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

A. $A + B = 0$

B. $AB = 0$

C. $A/B = -1$

D. None of these

Answer: A::C

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

A. A=1/3

B. A= -1/3

C. B= 1/6

D. B= -1/6

Answer: A::D

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3. Evaluate : $\int \log(1+x^2)dx.$

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

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Exercise Statement I And Ii Type Questions

1. Solve $\frac{dy}{dx} + \frac{y}{x} = \log x$.

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 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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3. 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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4. 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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5. Evaluate $\int\left(\tan^{-1}x + \cot^{-1}x\right)dx$

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

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

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

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

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

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

Answer: A

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5. Let F (x) be the primitive of 3 x + 2 √ x − 9 w.r.t. x. If F (10) = 60 , then the sum of digits of the value of F (13) , is ..... .

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6. n/m means that n is factor of m, then the relation f 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. Let f be differentiable function satisfying $f\left(\frac{x}{y}\right) = f(x) - f(y) \text{for all} x, y > 0$. If f'(1) = 1, then f(x) is

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. Let f be differentiable function satisfying $f\left(\frac{x}{y}\right) = f(x) - f(y) \text{for all} x, y > 0$. If f'(1) = 1, then f(x) is

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 continuous function such that

$f(x) - 2f\left(\frac{x}{2}\right) + f\left(\frac{x}{4}\right) = x^2.$

f(3) is equal to

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→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 ∫ g(x) f(x) dx does not contain any logarithm function and g(-2)=10. Then

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

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Exercise 5 Matching Type Questions

1. Find the mean marks of the following cummulative frequency table :

Marks	No. of students
0 and above	80
10 and above	77
20 and above	72
30 and above	65
40 and above	55
50 and above	43
60 and above	28
70 and above	16
80 and above	10
90 and above	8
100 and above	0

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2. If the sum of the series 2,5,8,11...is 60100 then find the value of n.

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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(a+b+c) equals to .....

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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) is

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

(a) 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. `Let f:R→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 ∫ g(x) f(x) dx does not contain any logarithm function and g(-2)=10. Then

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

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9. 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. Find the discriminant of the following quadratic equation :

$2x^2-2\sqrt{6x}+3=0$

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7. Find the discriminant of the following quadratic equation :

$3x^2+2\sqrt{5x}-5=0$

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8. Find the discriminant of the following quadratic equation :

$2x^2+5\sqrt{3x}+6=0$

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

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

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15. 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 $au_1 = y - bu_0, 2a^2u_2 = y(ax - 3b) - (ac - 3b^2)u_0$.

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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).

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. Let $I = \int \frac{e^x}{e^{4x} + e^{2x} + 1} dx$, $J = \int \frac{e^{-x}}{e^{-4x} + e^{-2x} + 1} dx$.

Then, for an arbitrary constant c, the value of $J - l$ equals 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. $\int \frac{dx}{e^x + e^{-x}}$ 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 $\int f(x)dx = F(x)$, then $\int x^3 f(x^2)dx$ is equal to

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

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

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

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

Answer: C

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7. $\int_{-2}^{2}(x + \sin x)dx$ is equal to :

A. -1

B. -2

C. 1

D. 2

Answer: D

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8. Evalualte : $\int \frac{\sin 2x}{(1-\sin x)(2-\sin x)} dx.$

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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