MATHS

BOOKS - CENGAGE PUBLICATION

INDEFINITE INTEGRATION

ILLUSTRATION

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

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2. Evaluate $\int \frac{2^{x+1} - 5^{x-1}}{10^x} dx$

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3. Evaluate: $\int \sec^2 x \cos ec^2 x dx$.

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4. Evaluate $\int \frac{1+\cos x}{1-\cos x} dx$.

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

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6. Evaluate: $\int \tan^{-1}\left\{\sqrt{\left(\frac{1-\cos x}{1+\cos x}\right)}\right\}$

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7. Evaluate: $\int \frac{\sec x}{\sec x - \tan x} dx$.

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

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9. $\int \cos^3 x \quad dx =$

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10. Evaluate $\int \left(\frac{8x + 13}{\sqrt{4x + 7}} \right) dx$

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

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12. Evaluate: $\int \sin^4 x\, dx$

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13. Evaluate $\int \sin x \sin 2x dx.$

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14. Evaluate: $\int \frac{dx}{(2x-7)(x-7)}$

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15. find $\int \frac{dx}{1+\sin x}$

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16. Evaluate the following:

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

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17. Evaluate the following :

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

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18. Evaluate: $\int \frac{\sin 2x}{a^2\sin^2 x + b^2\cos^2 x}dx.$

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19. Evaluate $\int \frac{1}{1+\cos x}dx$

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20. Evaluate: $\int \frac{\log\left(\tan\left(\frac{x}{2}\right)\right)}{\sin x} dx$

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21. Evaluate: $\int \sin^2 x dx$

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22. Evaluate: $\int \sec^n x \tan x dx$

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

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

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25. Evaluate $\int \left(x^6 + x^4 + x^2\right) \sqrt{2x^4 + 3x^2 + 6} dx.$

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26. Evaluate $\int \sin 2x d(\cot x).$

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27. Evaluate: $\int \{1 + 2\tan x(\tan x - \sec x)\}^{\frac{1}{2}} dx$

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28. Evaluate the following integration

$$\int \tan x \tan 2x \tan 3x dx$$

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29. Evaluate $\int \tan x \tan(x+1) dx.$

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

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

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

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

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

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

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

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37. Evaluate: $\int \sin(e^x)(e^x)dx$

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38. Evaluate $\int \cos^3 x\sqrt{\sin x}dx.$

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39. Evaluate: $\int 2^{2^x}\cdot 2^x dx$

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40. Evaluate: $\int \frac{e^{\sqrt{x}} \sin\left(e^{\sqrt{x}}\right)}{\sqrt{x}} dx$

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41. Find $\int \frac{e^x(1+x)}{\sin^2(xe^x)} dx$

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42. $\int 5^{x+\tan^{-1}x} \cdot \left(\frac{x^2+2}{x^2+1}\right) dx.$

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

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44. Evaluate: $\int\left(\left(\frac{e}{x}\right)^x+\left(\frac{x}{e}\right)^x\right)\ln x\,dx.$

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45. Evaluate: $\int\frac{1}{\left(\sqrt{e^{5x}}\left(\left(e^{2x}+e^{-2x}\right)^3\right)^{\frac{1}{4}}\right)}$

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46. Find $\int\sin^6 x\cos x dx.$

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47. Find $\int\sin^5 x\cos^3 x dx.$

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48. Find $\int \frac{dx}{\sin x \cos^3 x}$.

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49. Evaluate: $\int \frac{dx}{x^2(x^6+1)^{\frac{5}{6}}}$

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50. Evaluate $\int \frac{dx}{x^2\sqrt{1+x^2}}$.

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

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

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53. Evaluate: $\int \frac{1}{\left[(x-1)^3(x+2)^5\right]^{\frac{1}{4}}} dx$

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

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55. Evaluate: $\int \frac{1}{x^2+6x+5} dx$

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56. Evaluate: $\int \frac{\cos x}{\sin\left(x-\frac{\pi}{6}\right)\sin\left(x+\frac{\pi}{6}\right)}dx$

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57. Evaluate: $\int \frac{x}{x^4+2x^2+3}dx$

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58. Evaluate: $\int \frac{2x+1}{x^4+2x^3+x^2-1}dx$

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

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

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61. Evaluate: $\int \frac{x^2-1}{x^4-1}dx$

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62. Evaluate: $\int \frac{x^2-1}{x^4+x^2+1}\,dx$

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

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64. Evaluate: $\int \sqrt{\cot\theta}d\theta$

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65. Evaluate: $\int \frac{1}{\sqrt{(x-2)(x-3)}} dx$

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66. Evaluate: $\int \frac{\sec^2 x}{\sqrt{\tan^2 x + 16}} dx$

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

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68. Evaluate $\int \frac{\sec^2 x dx}{\sqrt{2 + 3\tan^2 x}}$.

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69. Evaluate $\int \sqrt{\sec x - 1} dx, 0 < x < \frac{\pi}{2}$

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70. Evaluate: $\int \sqrt{\frac{1+x}{x}} dx \cdot$

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71. Evaluate: $\int \frac{\sin x}{\sin 2x} dx \cdot$

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72. Evaluate: $\int \frac{1}{3 + \sin 2x} dx$

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73. Evaluate $\int \frac{dx}{\sin x + \cos x}$.

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74. If $\int \frac{3\sin x + 2\cos x}{3\cos x + 2\sin x} dx = ax + b\ln|2\sin x + 3\cos x| + C$, then (a) $a = -\frac{12}{13}, b = \frac{15}{39}$ (b) $a = -\frac{7}{13}, b = \frac{6}{13}$ (c) $a = \frac{12}{13}, b = \frac{15}{39}$ (d) $a = -\frac{7}{13}, b = -\frac{6}{13}$

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75. Evaluate: $\int \frac{1}{(x+3)\sqrt{x-1}} dx$

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

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

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

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

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80. Evaluate: $\int \frac{\sin x}{2+\sin 2x}dx$

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

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

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

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84. Evaluate: $\int \frac{(x-1)(x-2)(x-3)}{(x-4)(x-5)(x-6)}dx$

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

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86. Evaluate: $\int \frac{\sin x}{\sin 4x} dx$

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

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

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89. Evaluate: $\int \frac{(\log)_{ex} e \log_{e^2} e \log_{e^3 x} e}{x} dx$

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90. Evaluate $\int x \sin 3x dx$.

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91. Evaluate $\int x \log x dx$.

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

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93. Evaluate $\int x^2 e^{x^2} (2x) dx$

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

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

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96. If $f(x)$ is polynomaial function of degree n, prove that $\int e^x f(x) dx = e^x \left[f(x) - f'(x) + f''(x) - f'''(x) + \ldots\ldots + (-1)^n f^n(x) \right.$

where $f^n(x) = \frac{d^n f}{dx^n}$

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

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98. Evaluate : $\int \frac{\log_e 1+\sin^2 x}{\cos^2 x} dx$

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99. Evaluate: $\int e^{2x} \sin 3x dx$

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100. Evaluate $\int \frac{\cos(\log x)}{x} dx.$

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101. Evaluate: $\int e^{\sin \hat{} ((-1)x)} dx \cdot$

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

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103. $\int \sec^3 x dx$

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104. Evaluate: $\int (x-5)\sqrt{x^2+x}dx$

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105. Evaluate: $\int \left(\frac{\cos x}{x} - \log x^{\sin x}\right)dx.$

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106. Evaluate $\int \left(3x^2 \tan\frac{1}{x} - x\sec^2\frac{1}{x}\right)dx.$

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

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

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

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110. Evaluate :

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

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

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

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EXAMPLE

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

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

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

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

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

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6. Evaluate: $\int \sqrt{\frac{1+x^2}{x^2-x^4}}dx$

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7. Evaluate: If $\int \cos^n x dx$ prove that $I_n = \frac{1}{n}\left(\cos^{n-1} x \sin x\right) + \left(\frac{n-1}{n}\right) I_{n-2}$

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

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9. Evaluate:

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

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

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

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

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13. Evaluate: $\int \cos 2\theta \ln\left(\frac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}\right)d\theta$

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

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

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16. Evaluate for $m \in N$,

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

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17. Evaluate $\int \frac{dx}{\cos x\sqrt{\cos 2x}}$.

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18. $\int \left(\sin(101x).\sin^{99}x\right)dx$ equals

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CONCEPT APPLICATION EXERCISE 7.1

1. Evaluate $\int(\sec x - \tan x)^2 dx$

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2. Evaluate : $\int(1 - \cos x)\cos ec^2 x dx$

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3. Evaluate: $\int a^{mx} b^{nx} dx$

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4. Evaluate: $\int \frac{\sec x}{\sec x + \tan x} dx$.

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5. If $\int \frac{1}{x+x^5}dx = f(x)+c$,then the value of $\int \frac{x^4}{x+x^5}dx$.

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6. Evaluate: $\int (a\tan x + b\cot x)^2\, dx$

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7. Solve the following integration

$$\int \frac{\sin^4 x + \cos^4 x}{\sin^2 x \cdot \cos^2 x}dx$$

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8. Evaluate $\int \tan^{-1}(\sec x + \tan x)dx,\ -\pi/2 < x < \pi/2$

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9. Evaluate: $\int \frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha} dx$

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CONCEPT APPLICATION EXERCISE 7.2

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

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2. Evaluate: $\int (1 + 2x + 3x^2 + 4x^3 + \ldots.) dx, (|x| < 1)$

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3. Evaluate: $\int \frac{x^4}{x-1} dx$

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

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

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6. Evaluate: $\int \frac{\cos x - \sin x}{\cos x + \sin x}(2+2\sin 2x)dx$

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7. Evaluate $\int \sin x \cos x \cos 2x \cos 4x \cos 8x dx$

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CONCEPT APPLICATION EXERCISE 7.3

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

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

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3. Evaluate: $\int \{1 + \tan x \tan(x + \theta)\} \, dx$

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

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5. Evaluate: $\int \frac{(1+\log x)^3}{x} dx$

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6. $I = \int \frac{\log_e(\log_e x)}{x(\log_e x)} dx$ is equal to

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

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8. Evaluate: $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx$

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9. Evaluate $\int \text{cosec}^4 x dx$

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10. Evaluate $\int \frac{\sin^6 x}{\cos^8 x} dx$

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

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

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13. Evaluate $\int \tan^3 x dx$

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14. Evaluate $\int \frac{dx}{\cot^2 x - 1}$

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

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16. $If I = \int \frac{dx}{(2ax+x^2)^{\frac{3}{2}}}$,then I is equal to (a)$-\frac{x+a}{\sqrt{2ax+x^2}} + c$ (b) $-\frac{1}{a}\frac{x+a}{\sqrt{2ax+x^2}} + c$ (c)$-\frac{1}{a^2}\frac{x+a}{\sqrt{2ax+x^2}} + c$ (d) $-\frac{1}{a^3}\frac{x+a}{\sqrt{2ax+x^3}} + c$

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CONCEPT APPLICATION EXERCISE 7.4

1. Evaluate: $\int \frac{\sin 2x}{(a+b\cos x)^2} dx$

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2. Evaluate: $\int \frac{x^3 \tan^{-1} x^4}{1+x^8} dx$

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

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4. Evaluate $\int \frac{dx}{x+\sqrt{x}}$

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

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6. Evaluate: $\int \frac{1}{e^{x} - e^{-x}} dx$

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

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8. Evaluate: $\int \frac{ax^{3} + bx}{x^{4} + c^{2}} dx$

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

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

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11. Evaluate: $\int \frac{\sec x dx}{\sqrt{\cos 2x}}$

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12. Evaluate $\int \sin^5 x \cos^2 x dx$

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

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

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15. Evaluate: $\int \frac{dx}{x^2(1+x^7)^{\frac{6}{7}}}$

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

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17. Evaluate: $\int \frac{\left(x^5 - x\right)^{\frac{1}{5}}}{x^6} dx$

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18. Evaluate: $\int x^x 1n(ex) dx$

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19. Evaluate: $\int \frac{dx}{(x-p)\sqrt{(x-p)(x-q)}}$

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

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CONCEPT APPLICATION EXERCISE 7.5

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

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

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3. Evaluate: $\int \frac{x^2}{x^6+a^6}\,dx$

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4. Evaluate: $\int \frac{\sin x}{\cos 2x}\,dx$

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5. Evaluate: $\int \frac{e^x}{e^{2x} + 4e^x + 3} dx$

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

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

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8. Evaluate:

$$\int \frac{dx}{\sin^4 x + \cos^4 x}$$

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9. answer the foll. Questions: (ii)evaluate : $\int \frac{x^4+1}{x^6+1} dx$

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CONCEPT APPLICATION EXERCISE 7.6

1. Evaluate: $\int \frac{x^3}{\sqrt{1-x^8}} dx$

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

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

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

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5. Evaluate: $\int \frac{x^{\frac{3}{2}}}{\sqrt{1+x^5}}dx$

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6. Evaluate $\int \sqrt{1+\operatorname{cosec} x}dx, (\pi/2 < x < \pi)$

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CONCEPT APPLICATION EXERCISE 7.7

1. Evaluate: $\int \frac{1}{3+\sin 2x}dx$

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2. Evaluate: $\int \frac{\cos x dx}{16 + 25 \sin^2 x}$

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

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

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

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

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

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

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

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10. Evaluate: $\int(\sqrt{\tan x}-\sqrt{\cot x})\,dx$

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CONCEPT APPLICATION EXERCISE 7.8

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

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

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3. Evaluate: $\int\frac{1}{x^4-1}dx$

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

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

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6. Evaluate: $\int \frac{\cos 2x \sin 4x dx}{\cos^4 x(1+\cos^2 2x)}$

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

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CONCEPT APPLICATION EXERCISE 7.9

1. Evaluate $\int x \sin x dx$

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2. Evaluate $\int \cos \sqrt{x} dx$

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

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4. Evaluate: If $\int f(x)dx = g(x), then \int f^{-1}(x)dx$

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5. Evaluate: $\int [f(x)g''(x) - f''(x)g(x)]dx$

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6. Evaluate: If $\int f(x)dx = g(x), then \int f^{-1}(x)dx$

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7. Evaluate $\int (\log_e x)^2 dx$

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8. $\int \frac{x \cos^{-1} x}{\sqrt{1-x^2}} dx$

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

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10. Evaluate: $\int \cos ecx \log\left(\cot\left(\frac{x}{2}\right)\right)dx$

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11. Evaluate: $\int \sin^2(\log x)dx$

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12. Evaluate: $\int e^x\left(1+\tan x+\tan^2 x\right)dx$

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

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

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15. Evaluate $\int\sqrt{x^2+4x+8}dx$

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EXERCISES (Single Correct Answer Type)

1. $I=\int\frac{\sin^8 x-\cos^8 x}{1-2\sin^2 x\cos^2 x}dx$ is equal to:

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

B. $-\frac{1}{2}\sin 2x+C$

C. $-\frac{1}{2}\sin x+C$

D. $-\sin^2 x+C$

Answer: B

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2. If $\int \frac{\cos 4x + 1}{\cot x - \tan x} dx = A \cos 4x + B$, *then* (a) $A = -\frac{1}{8}$ (b) $B = \frac{1}{2}$ (c) $A = -\frac{1}{4}$ (d) None of this

A. $A = -1/2$

B. $A = -1/8$

C. $A = -1/4$

D. none of these

Answer: B

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3. $\int \left(\sqrt{\frac{a+x}{a-x}} + \sqrt{\frac{a-x}{a+x}} \right) dx$ is equal to

A. $2\sin^{-1}(x/a)+c$

B. $2a\sin^{-1}(x/a)+c$

C. $2\cos^{-1}(x/a)+c$

D. $2a\cos^{-1}(x/a)+c$

Answer: B

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4. $\int\sqrt{1+\sin x}dx$ is equal to

A. $\sqrt{1-\sin x}+C$

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

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

D. $2\sqrt{1-\sin x}+C$

Answer: A

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

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6. If $\int \sqrt{1+\sin x} f(x) dx = \frac{2}{3}(1+\sin x)^{\frac{3}{2}} + c, then f(x) equal \cos x$ (b) $\sin x$ (c) $\tan x$ (d) 1

A. $\cos x$

B. $\sin x$

C. $\tan x$

D. 1

Answer: A

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7. $\int \frac{\sqrt{x-1}}{x\sqrt{x+1}} dx is equal \to$ $\ln\left|x-\sqrt{x^2-1}\right| - \tan^{-1} x + c$, $\ln\left|x+\sqrt{x^2-1}\right| - \tan^{-1} x + c$, $\ln\left|x-\sqrt{x^2-1}\right| - \sec^{-1} x + c$, $\ln\left|x+\sqrt{x^2-1}\right| - \sec^{-1} x + c$

A. In $\left|x-\sqrt{x^2-1}\right| - \tan^{-1} x + c$

B. In $\left|x+\sqrt{x^2-1}\right| - \tan^{-1} x + c$

C. In $\left|x-\sqrt{x^2-1}\right| - \sec^{-1} x + c$

D. In $\left|x+\sqrt{x^2-1}\right| - \sec^{-1} x + c$

Answer: D

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8. $If I = \int \frac{dx}{\sec x + \cos ecx}, then I equals$

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

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

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

D. $\frac{1}{2}[\sin x-\cos x]-\frac{1}{\sqrt{2}}\log|\operatorname{cosec}(x+\pi/4)-\cot(x+\pi/4)|+C$

Answer: D

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9. $\int\frac{\sin x}{\sin\left(x-\frac{\pi}{4}\right)}dx$ is equal to

A. $\frac{1}{\sqrt{2}}\left(x+\log_e\left|\cos\left(x-\frac{\pi}{4}\right)\right|\right)+c$

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

C. $\sqrt{2}\left(x+\log_e\left|\sin\left(x-\frac{\pi}{4}\right)\right|\right)+c$

D. $\frac{1}{\sqrt{2}}\left(x+\log_e\left|\sin\left(x-\frac{\pi}{4}\right)\right|\right)+c$

Answer: D

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10. Prove that, $\int \frac{\cos 5x + \cos 4x}{1 - 2\cos 3x} dx = -\left(\frac{1}{2}\sin 2x + \sin x\right) + c$

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

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

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

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

Answer: C

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11. $IfI = \int \sqrt{\frac{5-x}{2+x}} dx, thenIequal$

$\sqrt{x+2}\sqrt{5+x} + 3\sin^{-1}\sqrt{\frac{x+2}{3}} + C$

$\sqrt{x+2}\sqrt{5-x} + 7\sin^{-1}\sqrt{\frac{x+2}{7}} + C$

$\sqrt{x+2}\sqrt{5-x} + 5\sin^{-1}\sqrt{\frac{x+2}{5}} + C$ none of these

A. $\sqrt{x+2}\sqrt{5-x} + 3\sin^{-1}\sqrt{\frac{x+2}{3}} + C$

B. $\sqrt{x+2}\sqrt{5-x}+7\sin^{-1}\sqrt{\frac{x+2}{7}}+C$

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

D. non of these

Answer: B

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12. $\int\frac{\sin 2x}{\sin 5x\sin 3x}dx$ is equal to

A. $\log\sin 3x-\log\sin 5x+c$

B. $\frac{1}{3}\log\sin 3x+\frac{1}{5}\log\sin 5x+c$

C. $\frac{1}{3}\log\sin 3x-\frac{1}{5}\log\sin 5x+c$

D. $3\log\sin 3x-5\log\sin 5x+c$

Answer: C

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

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

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

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

D. non of these

Answer: A

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14. Evaluate: $\int \frac{dx}{\sqrt{\sin^3 x \sin(x+\alpha)}}$

A. $-2\text{cosec}\alpha(\cos\alpha-\tan x\sin\alpha)^{1/2}+C$

B. $-2(\cos\alpha+\cot x\sin\alpha)^{1/2}+C$

C. $-2\text{cosec}\alpha(\cos\alpha+\cot x\sin\alpha)^{1/2}+C$

D. $-2\text{cosec}\alpha(\sin\alpha-\cot x\cos\alpha)^{1/2}+C$

Answer: C

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

(1) $-\frac{x^p}{x^{p+q}+1} + C$ (2) $\frac{x^q}{x^{p+q}+1} + C$

(3) $-\frac{x^q}{x^{p+q}+1} + C$ (4) $\frac{x^p}{x^{p+q}+1} + C$

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16. If $y = \int \frac{1}{(1+x^2)^{\frac{3}{2}}} dx$ and $y = 0$ when $x = 0$, then value of y when $x = 1$ is

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}$

C. $2\sqrt{2}$

D. none of these

Answer: A

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

A. $2\left\{x^{2/3}+\frac{4}{11}x^{11/6}+\frac{6}{13}x^{13/6}+\frac{4}{15}x^{5/2}+\frac{1}{17}x^{17/6}\right\}+c$

B. $6\left\{x^{2/3}-\frac{4}{11}x^{11/6}+\frac{6}{13}x^{13/6}-\frac{4}{15}x^{5/2}+\frac{1}{17}x^{17/6}\right\}+c$

C. $6\left\{\frac{1}{9}x^{3/2}+\frac{4}{11}x^{11/6}+\frac{6}{13}x^{13/6}+\frac{4}{15}x^{5/2}+\frac{1}{17}x^{17/6}\right\}+c$

D. non of these

Answer: C

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18. $\int \frac{In(\tan x)}{\sin x \cos x}dx$ is equal to

A. $\frac{1}{2}In(\tan x)+c$

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

C. $\frac{1}{2}(In(\tan x))^2+c$

D. non of these

Answer: C

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19. If m is a non-zero number and $\int\frac{x^{5m-1}+2x^{4m-1}}{\left(x^{2m}+x^m+1\right)^3}dx=f(x)+c$, then f(x) is:

A. $\frac{x^{6m}+x^{2m}}{2m\left(x^{2m}+x^m+1\right)^2}+c$

B. $\frac{x^{4m}}{2m\left(x^{2m}+x^m+1\right)^2}+c$

C. $\frac{2mx^{4m}}{\left(x^{2m}+x^m+1\right)^2}+c$

D. $\frac{mx^{5m}}{2\left(x^{2m}+x^m+1\right)^2}+c$

Answer: B

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20. If $l^r(x)$ means $\log\log\log.....x$, the log being repeated r times, then $\int\left[xl(x)l^2(x)l^3(x)....\,.\,l^r(x)\right]^{-1}dx$ is equal to $l^{r+1}(x)+C$ (b) $\frac{l^{r+1}(x)}{r+1}+C$ (c)$l^r(x)+C$ (d) none of these

A. $l^{r+1}(x)+C$

B. $\frac{l^{r+1}(x)}{r+1}+C$

C. $l^r(x)+C$

D. non of these

Answer: A

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

A. $\sqrt{2}\log\left(\sqrt{\tan x}-\sqrt{\cot x}\right)+C$

B. $\sqrt{2}\log\left|\sin x+\cos x+\sqrt{\sin 2x}\right|+C$

C. $\sqrt{2}\log\left|\sin x - \cos x + \sqrt{2}\sin x\cos x\right| + C$

D. $\sqrt{2}\log\left|\sin(x+\pi/4) + \sqrt{2}\sin x\cos x\right| + C$

Answer: B

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22. $If I = \int \frac{\sin 2x}{(3+4\cos x)^3} dx, then I equals \quad \frac{3\cos x + 8}{(3+4\cos x)^2} + C$ (b) $\frac{3+8\cos x}{16(3+4\cos x)^2} + C \frac{3\cos x}{(3+4\cos x)^2} + C$ (d) $\frac{3-8\cos x}{16(3+4\cos x)^2} + C$

A. $\frac{3\cos x + 8}{(3+4\cos x)^2} + C$

B. $\frac{3+8\cos x}{16(3+4\cos x)^2} + C$

C. $\frac{3+\cos x}{(3+4\cos x)^2} + C$

D. $\frac{3-8\cos x}{16(3+4\cos x)^2} + C$

Answer: B

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23. $\int \frac{\ln\left(\frac{x-1}{x+1}\right)}{x^2-1} dx is equa < o$

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

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

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

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

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

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

C. $\frac{1}{4}\left(\text{In}\left(\frac{x-1}{x+1}\right)\right)^2 + C$

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

Answer: C

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24. $\int \sqrt{e^x - 1} dx$ is equal to

(a) $2\left[\sqrt{e^x - 1} - \tan^{-1}\sqrt{e^x - 1}\right] + c$

(b) $\sqrt{e^x - 1} - \tan^{-1}\sqrt{e^x - 1} + c$

(c) $\sqrt{e^x-1}+\tan^{-1}\sqrt{e^x-1}+c$

(d) $2\left[\sqrt{e^x-1}-\tan^{-1}\sqrt{e^x-1}\right]+c$

A. $2\left[\sqrt{e^x-1}-\tan^{-1}\sqrt{e^x-1}\right]+c$

B. $\sqrt{e^x-1}-\tan^{-1}\sqrt{e^x-1}+c$

C. $\sqrt{e^x-1}+\tan^{-1}\sqrt{e^x-1}+c$

D. $2\left[\sqrt{e^x-1}+\tan^{-1}\sqrt{e^x-1}\right]+c$

Answer: A

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

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

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

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

D. $\log_e\left|\frac{1-\sqrt{1-x^4}}{1+\sqrt{1-x^4}}\right|+\frac{1}{2}\cos^{-1}(x^2)+C$

Answer: A

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26. $\int \frac{\sqrt{x^2+10x+24}}{x+5}dx$ is equal to

A. $\sqrt{x^2+10x+24}+\sec^{-1}(x+5)+c$

B. $\sqrt{x^2+10x+24}-\text{cosec}^{-1}(x+5)+c$

C. $\sec^{-1}(x+5)-\sqrt{x^2+10x+24}+c$

D. $\sqrt{x^2+10x+24}-\sec^{-1}(x+5)+c$

Answer: D

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

A. $\sec^{-1}(x^x)+c$

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

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

D. $\cot^{-1}(x^x) + c$

Answer: A

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28.

If $\int x^5 (1 + x^3)^{2/3} dx = A(1 + x^3)^{8/3} + B(1 + x^3)^{5/3} + c,$ then find A and B

A. $A = \frac{1}{4}, B = \frac{1}{5}$

B. $A = \frac{1}{8}, B = -\frac{1}{5}$

C. $A = -\frac{1}{8}, B = \frac{1}{5}$

D. non of these

Answer: B

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29. Evaluate: $\int \frac{\sin 2x}{\sin^4 x + \cos^4 x} dx$

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

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

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

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

Answer: B

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30. $\int \frac{x+2}{(x^2+3x+3)\sqrt{x+1}} dx$ is equal to $\frac{1}{3}\tan^{-1}\left(\frac{x}{\sqrt{3(x+1)}}\right)$ (b) $\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3(x+1)}}\right)$ $\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{x+1}}\right)$ (d) none of these

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

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

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

D. non of these

Answer: B

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31. Evaluate the following Integrals :

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

A. $\frac{\sec A}{\sqrt{2}}\sqrt{\tan x\cos A-\sin A}+c$

B. $\sqrt{2}\sec A\sqrt{\tan x\cos A-\sin A}+c$

C. $\sqrt{2}\sec A\sqrt{\tan x\cos A+\sin A}+c$

D. none of these

Answer: C

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32. $\int \frac{\cos 2x}{(e^{-x}+\cos x)\sqrt{1+\sin 2x}}dx, x \in \left(0, \frac{\pi}{2}\right)$ is equal to

A. $\log_e|1+e^x \sin x|+c$

B. $\log_e|e^x+\cos x|+c$

C. $\log_e|1+e^x \cos x|-x+c$

D. $\log_e|1+e^x \cos x|+c$

Answer: D

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33. $I=\int \frac{\cos 4x+1}{\cot x-\tan x}dx$ is equal to ?

A. $\frac{1}{2}In|\sec 2x|-\frac{1}{4}\cos^2 2x+c$

B. $\frac{1}{2}In|\sec 2x|+\frac{1}{4}\cos^2 x+c$

C. $\frac{1}{2}In|\cos 2x|-\frac{1}{4}\cos^2 2x+c$

D. $\frac{1}{2}In|\cos 2x| + \frac{1}{4}\cos^2 x + c$

Answer: C

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34. If $\int \frac{dx}{x^2(x^n+1)^{\frac{n-1}{n}}} = -(f(x))^{\frac{1}{n}} + C$ then $f(x)$ is (A) $1 + x^n$ (B) $1 + x^{-n}$ (C) $x^n + x^{-n}$ (D) $x^n - x^{-n}$

A. $(1 + x^n)$

B. $1 + x^{-n}$

C. $x^n + x^{-n}$

D. none of these

Answer: B

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35. $\int\sqrt{\frac{\cos x-\cos^3 x}{1-\cos^3 x}}dx$ is equal to

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

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

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

D. non of these

Answer: C

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36. $\int x\left(\frac{\ln a^{a^{\frac{x}{2}}}}{3a^{\frac{5x}{2}}b^{3x}}+\frac{\ln b^{b^x}}{2a^{2x}b^{4x}}\right)dx\,(where a,b\in R^+)is$ (a) $\frac{1}{6\ln a^2b^3}a^{2x}b^{3x}\frac{\ln\left(a^{2x}b^{3x}\right)}{e}+k$ (b) $\frac{1}{6\ln a^2b^3}\frac{1}{a^{2x}b^{3x}}\frac{\ln 1}{ea^{2x}b^{3x}}+k$ (c) $\frac{1}{6\ln a^2b^3}\frac{1}{a^{2x}b^{3x}}\ln\left(a^{2x}b^{3x}\right)+k$ (d) $-\frac{1}{6\ln a^2b^3}\frac{1}{a^{2x}b^{3x}}\ln\left(e\left(a^{2x}b^{3x}\right)\right)+k$

A. $\frac{1}{6Ina^2b^3}a^{2x}b^{3x}In\frac{a^{2x}b^{3x}}{e}+k$

B. $\frac{1}{6Ina^2b^3}\frac{1}{a^{2x}b^{3x}}In\frac{1}{ea^{2x}b^{3x}}+k$

C. $\frac{1}{6Ina^2b^3}\frac{1}{a^{2x}b^{3x}}In\left(a^{2x}b^{3x}\right)+k$

D. $-\frac{1}{6Ina^2b^3}\frac{1}{a^{2x}b^{3x}}In\left(a^{2x}b^{3x}\right)+k$

Answer: B

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37. $\int\frac{3+2\cos x}{(2+3\cos x)^2}dx$ is equal to

(a) $\left(\frac{\sin x}{3\cos x+2}\right)+c$

(b) $\left(\frac{2\cos x}{3\sin x+2}\right)+c$

(c) $\left(\frac{2\cos x}{3\cos x+2}\right)+c$

(d) $\left(\frac{2\sin x}{3\sin x+2}\right)+c$

A. $\left(\frac{\sin x}{3\cos x+2}\right)+c$

B. $\left(\frac{2\cos x}{3\sin x+2}\right)+c$

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

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

Answer: A

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38. If $\frac{d}{dx}f(x) = f'(x)$, then $\int \frac{xf'(x) - 2f(x)}{\sqrt{x^4 f(x)}}dx$ is equal to

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

B. $|x|f'(x) + c$

C. $\frac{2\sqrt{f(x)}}{|x|} + c$

D. $|x|\sqrt{f(x)} + c$

Answer: C

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39. The value of the integral $\int \frac{(1 - \cos\theta)^{\frac{2}{7}}}{(1 + \cos\theta)^{\frac{9}{7}}}d\theta$ is

A. $\frac{7}{11}\left(\tan\frac{\theta}{2}\right)^{\frac{11}{7}}+C$

B. $\frac{7}{11}\left(\cos\frac{\theta}{2}\right)^{\frac{11}{7}}+C$

C. $\frac{7}{11}\left(\sin\frac{\theta}{2}\right)^{\frac{11}{7}}+C$

D. none of these

Answer: A

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40. If $\int\frac{dx}{\sqrt{\sin^3 x\cos^5 x}}=a\sqrt{\cot x}+b\sqrt{\tan^3 x}+c,$ then $a=-1,b=\frac{1}{3}$ (b) $a=-3,b=\frac{2}{3}$ $a=-2,b=\frac{4}{3}$ (d) none of these

A. $a=-1,b=1/3$

B. $a=-3,b=2/3$

C. $a=-2,b=4/3$

D. $a=-2,b=2/3$

Answer: D

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41. $If \int \frac{dx}{\cos^3 x \sqrt{\sin 2x}} = a\left(\tan^2 x + b\right)\sqrt{\tan x} + c, then$

$a = \frac{\sqrt{2}}{5}, b = \frac{1}{\sqrt{5}}$ $a = \frac{\sqrt{2}}{5}, b = 5$ $a = \frac{\sqrt{2}}{5}, b = -\frac{1}{\sqrt{5}}$ (d)

$a = \frac{\sqrt{2}}{5}, b = \sqrt{5}$

A. $a = \frac{\sqrt{2}}{5}, b = \frac{1}{\sqrt{5}}$

B. $a = \frac{\sqrt{2}}{5}, b = 5$

C. $a = \frac{\sqrt{2}}{5}, b = -\frac{1}{\sqrt{5}}$

D. $a = \frac{\sqrt{2}}{5}, b = \sqrt{5}$

Answer: B

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

A. $a = -\frac{1}{10}, b = -\frac{2}{5}$

B. $a = \frac{1}{10}, b = -\frac{2}{5}$

C. $a = -\frac{1}{10}, b = \frac{2}{5}$

D. $a = \frac{1}{10}, b = \frac{2}{5}$

Answer: C

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43. $If \int \frac{3e^x - 5e^{-x}}{4e^x + 5e^{-x}} dx = ax + b\ln\left(4e^x + 5e^{-x}\right) + C, then$ (a) $a = -\frac{1}{8}, b = \frac{7}{8}$ (b) $a = \frac{1}{8}, b = \frac{7}{8}$ (c) $a = -\frac{1}{8}, b = -\frac{7}{8}$ (d) $a = \frac{1}{8}, b = -\frac{7}{8}$

A. $a = -\frac{1}{8}, b = \frac{7}{8}$

B. $a = \frac{1}{8}, b = \frac{7}{8}$

C. $a = -\frac{1}{8}, b = -\frac{7}{8}$

D. $a = \frac{1}{8}, b = -\frac{7}{8}$

Answer: A

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44. If $\int f(x)\sin x\cos x dx = \frac{1}{2(b^2-a^2)}\ln f(x) + c$,then f(x) is equal to

A. $\frac{1}{a^2\sin^2 x + b^2\cos^2 x}$

B. $\frac{1}{a^2\sin^2 x - b^2\cos^2 x}$

C. $\frac{1}{a^2\cos^2 x + b^2\sin^2 x}$

D. $\frac{1}{a^2\cos^2 x - b^2\sin^2 x}$

Answer: A

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45. $\int \frac{x^5}{(4x^2+1)^4} dx$ is equal to

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46. If $\int \frac{1}{x\sqrt{1-x^3}}dx = a\log\left|\frac{\sqrt{1-x^3}-1}{\sqrt{1-x^3}+1}\right| + b, thenaisequal\ \frac{1}{3}$ (b) $\frac{2}{3}$ (c) $-\frac{1}{3}$ (d0 $-\frac{2}{3}$

A. $1/3$

B. $2/3$

C. $-1/3$

D. $-2/3$

Answer: A

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47. The value of the integral $\int (x^2+x)\left(x^{-8}+2x^{-9}\right)^{\frac{1}{10}}dx$ is $\frac{5}{11}\left(x^2+2x\right)^{\frac{11}{10}}+c$ (b) $\frac{5}{6}(x+1x)^{\frac{11}{10}}+c$ $\frac{6}{7}(x+1)^{\frac{11}{10}}+c$ (d) none of these

A. $\frac{5}{11}\left(x^2+2x\right)^{11/10}+c$

B. $\frac{5}{6}(x+1)^{11/10}+c$

C. $\frac{6}{7}(x+1)^{11/10}+c$

D. none of these

Answer: A

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48. $\int \frac{x^3 dx}{\sqrt{1+x^2}} isequa < o$ $\frac{1}{3}\sqrt{1+x^2}\left(2+x^2\right)+C$ $\frac{1}{3}\sqrt{1+x^2}\left(x^2-1\right)+C$ $\frac{1}{3}\left(1+x^2\right)^{\frac{3}{2}}+C$ (d) $\frac{1}{3}\sqrt{1+x^2}\left(x^2-2\right)+C$

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

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

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

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

Answer: D

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49. If $I = \int \frac{dx}{(a^2 - b^2x^2)^{3/2}}$, then I equals

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

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

C. $\frac{ax}{\sqrt{a^2 - b^2x^2}} + C$

D. none of these

Answer: B

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50. $\int \frac{x^4 - 1}{x^2\sqrt{x^4 + x^2 + 1}} dx =$ (a) $\sqrt{x^2 + \frac{1}{x^2} + 1} + C$ (b) $\frac{\sqrt{x^4 + x^2 + 1}}{x^2} + C$ (c) $\frac{\sqrt{x^4 + x^2 + 1}}{x} + C$ (d) none of these

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

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

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

D. none of these

Answer: A

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

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

B. $x^3\left(x^2+1\right)^{-1/2}+C$

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

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

Answer: A

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52. $\int \frac{1+2x^6}{\left(1-x^6\right)^{3/2}} dx$ is equal to

A. $\frac{2x}{\sqrt{1+x^6}}+c$

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

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

D. $\frac{x^2+x}{\sqrt{1-x^6}}+C$

Answer: B

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53. The integral $\int \frac{2x^{12}+5x^9}{\left[x^5+x^3+1\right]^3}.dx$ is equal to-

A. $\frac{x^{10}}{2(1+x^3+x^5)^4}+c$

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

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

D. $\frac{2x^{10}}{(x^5+x^3+1)^3}+c$

Answer: C

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54. If $I_n = \int (\ln x)^n dx$ then $I_n + nI_{n-1}$

A. $\frac{(\text{In } x)^n}{x} + C$

B. $x(\text{In } x)^{n-1} + C$

C. $x(\text{In } x)^n + C$

D. none of these

Answer: C

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55. Let $\int e^x \{f(x) - f'(x)\} dx = \varphi(x)$. Then $\int e^x f(x) dx$ is

A. $\phi(x) = e^x f(x)$

B. $\phi(x) - e^x f(x)$

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

D. $\frac{1}{2}\{\phi(x)+e^{x}f'(x)\}$

Answer: C

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56. For $x>1$, $\int \sin^{-1}\left(\frac{2x}{1+x^{2}}\right)dx$ is equal to

A. $x\tan^{-1}x-In\left|\sec\left(\tan^{-1}x\right)\right|+c$

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

C. $x\tan^{-1}x-In\left|\cos\left(\tan^{-1}x\right)\right|+c$

D. none of these

Answer: D

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57. If

$$\int \frac{x \ln\left(x+\sqrt{1+x^2}\right)}{\sqrt{1+x^2}} dx = a\sqrt{1+x^2}\ln\left(x+\sqrt{1+x^2}\right)+bx+c \quad ,$$

then (A) $a=1, b=-1$ (B) $a=1, b=1$ (C) $a=-1, b=1$ (D) $a=-1, b=-1$

A. $a=1, b=-1$

B. $a=1, b=1$

C. $a=-1, b=1$

D. $a=-1, b=-1$

Answer: A

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58. $If \int x \log\left(1+\frac{1}{x}\right) dx = f(x)\log(x+1)+g(x)x^2+Ax+C,$ then $f(x)=\frac{1}{2}x^2$ (b) $g(x)=\log x$ $A=1$ (d) none of these

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

B. $g(x) = \log x$

C. $A = 1$

D. none of these

Answer: D

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59. If $I = \int e^{-x} \log(e^x + 1) dx, then I equal$

$a + (e^{-x} + 1)\log(e^x + 1) + C$ $a + (e^x + 1)\log(e^x + 1) + C$

$a - (e^{-x} + 1)\log(e^x + 1) + C$ none of these

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

B. $x + (e^x + 1)\log(e^x + 1) + C$

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

D. none of these

Answer: C

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60. Find the value of $\int x \sec^2 x dx$

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61. $\int x \sin x \sec^3 x dx$ is equal to

A. $\frac{1}{2}\left[\sec^2 x - \tan x\right] + c$

B. $\frac{1}{2}\left[x \sec^2 x - \tan x\right] + c$

C. $\frac{1}{2}\left[x \sec^2 x + \tan x\right] + c$

D. $\frac{1}{2}\left[\sec^2 x + \tan x\right] + c$

Answer: B

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62. $\int e^{\tan^{-1}x}\left(1+x+x^2\right)d\left(\cot^{-1}x\right)$ is equal to (a) $-e^{\tan^{-1}x}+c$ (b) $e^{\tan^{-1}x}+c$ (c) $-xe^{\tan^{-1}x}+c$ (d) $xe^{\tan^{-1}x}+c$

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

B. $e^{\tan^{-1}x}+c$

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

D. $xe^{\tan^{-1}x}+c$

Answer: C

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63. $\int e^x\left(\frac{2\tan x}{1+\tan x}+\cot^2\left(x+\frac{\pi}{4}\right)\right)dx$ is equal to (a) $e^x\tan\left(\frac{\pi}{4}-x\right)+c$ (b) $e^x\tan\left(x-\frac{\pi}{4}\right)+c$ (c) $e^x\tan\left(\frac{3\pi}{4}-x\right)+c$ (d) none of these

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

B. $e^x\tan\left(x-\frac{\pi}{4}\right)+c$

C. $e^x \tan\left(\frac{3\pi}{4} - x\right) + c$

D. none of these

Answer: B

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64. $\int e^{x^4}\left(x^3\right)dx$ is equal to

A. $\frac{1}{2}e^{x^4} + c$

B. $\frac{1}{4}e^{x^4} + c$

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

D. $\frac{1}{3}e^{x^4} + c$

Answer: D

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65. The value of integral $\int e^x \left(\frac{1}{\sqrt{1+x^2}} + \frac{1-2x^2}{\sqrt{(1+x^2)^5}} \right) dx$ is equal to

$(a) e^x \left(\frac{1}{\sqrt{1+x^2}} + \frac{x}{\sqrt{(1+x^2)^3}} \right) + c$

$(b) e^x \left(\frac{1}{\sqrt{1+x^2}} - \frac{x}{\sqrt{(1+x^2)^3}} \right) + c$

$(c) e^x \left(\frac{1}{\sqrt{1+x^2}} + \frac{x}{\sqrt{(1+x^2)^5}} \right) + c$

(d)none of these

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

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

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

D. none of these

Answer: A

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

(a) $\left(\frac{x-1}{x+1}\right) e^x + c$

(b) $e^x \left(\frac{x+1}{x-1}\right) + c$

$e^x (x+1)(x-1) + c$

(d) none of these

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

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

C. $e^x (x+1)(x-1) + c$

D. none of these

Answer: A

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67. $\int \left(\frac{x+2}{x+4}\right)^2 e^x dx$ is equal to

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

B. $e^x\left(\frac{x+2}{x+4}\right)+c$

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

D. $\left(\frac{2xe^2}{x+4}\right)+c$

Answer: A

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68. $\int e^{\tan x}(\sec x-\sin x)dxisequa<o\ e^{\tan x}\cos x+C\ e^{\tan x}\sin x+C$ $-e^{\tan x}\cos x+C\,e^{\tan x}\sec x+C$

A. $e^{\tan x}\cos x+C$

B. $e^{\tan x}\sin x+C$

C. $-e^{\tan x}\cos x+C$

D. $e^{\tan x}\sec x+C$

Answer: C

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69. $\int \frac{\cos ec^2 x - 2005}{\cos^{2005} x} dx$ is equal to (a) $-\frac{\cot x}{(\cos x)^{2005}} + c$ (b) $\frac{\tan x}{(\cos x)^{2005}} + c$ (c) $-\frac{\tan x}{(\cos x)^{2005} + c}$ (d) none of these

A. $\frac{\cot x}{(\cos x)^{2005}} + c$

B. $\frac{\tan x}{(\cos x)^{2005}} + c$

C. $\frac{-(\tan x)}{(\cos x)^{2005}} + c$

D. none of these

Answer: D

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70. $\int \left(1 + 2x^2 + \frac{1}{x}\right) e^{x^2 - \frac{1}{x}} dx$ is equal to (a) $-xe^{x^2 - \frac{1}{x}} + c$ (b) $xe^{x^2 - \frac{1}{x}} + c$ (c) $(2x - 1)e^{x^2 - \frac{1}{x}} + c$ (d) $(2x + 1)e^{x^2 - \frac{1}{x}} + c$

A. $-xe^{x^2 - \frac{1}{x}} + c$

B. $xe^{x^2-\frac{1}{x}}+c$

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

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

Answer: B

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71. $\int e^{\sin^{-1}x}\left(\frac{\log_e x}{\sqrt{1-x^2}}+\frac{1}{x}\right)dx$ is equal to

A. $\log_e x \cdot e^{\sin^{-1}x}+c$

B. $\frac{e^{\sin^{-1}x}}{x}+c$

C. $-\log_e x \cdot e^{\sin^{-1}x}+c$

D. $e^{\sin^{-1}x}\left(\log_e x+\frac{1}{x}\right)+c$

Answer: A

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72. $If x f(x) = 3f^2(x) + 2, then \int \frac{2x^2 - 12xf(x) + f(x)}{(6f(x) - x)(x^2 - f(x))^2} dx$ equal.

(A) $\frac{1}{x^2 - f(x)} + c$ (B) $\frac{1}{x^2 + f(x)} + c$ (C) $\frac{1}{x - f(x)} + c$ (D) $\frac{1}{x + f(x)} + c$

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

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

C. $\frac{1}{x - f(x)} + c$

D. $\frac{1}{x + f(x)} + c$

Answer: A

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73. The value of $\int \frac{ax^2 - b}{x\sqrt{c^2x^2 - (ax^2 + b)^2}}$ (a) $\frac{1}{c}\sin^{-1}\left(ax + \frac{b}{x}\right) + k$ (b) $c\sin^{-1}\left(a + \frac{b}{x}\right) + e$ (c) $\sin^{-1}\left(\frac{ax + \frac{b}{x}}{c}\right) + k$ (d) none of these

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

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

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

D. none of these

Answer: C

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74. $\int\frac{dx}{\left(1+\sqrt{x}\right)\sqrt{x-x^2}}$ is equal to ?

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

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

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

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

Answer: D

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75. $\int \frac{2\sin x}{3+\sin 2x}dx$ is equal to

A. $\frac{1}{2}\text{In}\left|\frac{2+\sin x-\cos x}{2-\sin x+\cos x}\right|-\frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{\sin x+\cos x}{\sqrt{2}}\right)+c$

B. $\frac{1}{2}\text{In}\left|\frac{2+\sin x-\cos x}{2-\sin x+\cos x}\right|-\frac{1}{2\sqrt{2}}\tan^{-1}\left(\frac{\sin x+\cos x}{\sqrt{2}}\right)+c$

C. $\frac{1}{4}\text{In}\left|\frac{2+\sin x-\cos x}{2-\sin x+\cos x}\right|-\frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{\sin x+\cos x}{\sqrt{2}}\right)+c$

D. none of these

Answer: C

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76. $4\int\frac{\sqrt{a^6+x^8}}{x}dx$ is equal to (a) $\sqrt{a^6+x^8}+\frac{a^3}{2}\ln\left|\frac{\sqrt{a^6+x^8}+a^3}{\sqrt{a^6+x^8}-a^3}\right|+c$ (b) $a^6\ln\left|\frac{\sqrt{a^6+x^8}-a^3}{\sqrt{a^6+x^8}+a^3}\right|+c$ (c) $\sqrt{a^6+x^8}+\frac{a^3}{2}\ln\left|\frac{\sqrt{a^6+x^8}-a^3}{\sqrt{a^6+x^8}+a^3}\right|+c$ (d) $a^6\ln\left|\frac{\sqrt{a^6+x^8}+a^3}{\sqrt{a^6+x^8}-a^3}\right|+c$

A. $\sqrt{a^6+x^8}+\frac{a^3}{2}In\left|\frac{\sqrt{a^6+x^8}+a^3}{\sqrt{a^6+x^8}-a^3}\right|+c$

B. $a^6 In\left|\frac{\sqrt{a^6+x^8}-a^3}{\sqrt{a^6+x^8}+a^3}\right|+c$

C. $\sqrt{a^6+x^8}+\frac{a^3}{2}In\left|\frac{\sqrt{a^6+x^8}-a^3}{\sqrt{a^6+x^8}+a^3}\right|+c$

D. $a^6 In\left|\frac{\sqrt{a^6+x^8}+a^3}{\sqrt{a^6+x^8}-a^3}\right|+c$

Answer: C

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77. $IfI_{m,n}=\int\cos^m x\sin nxdx, then 7I_{4,3}-4I_{3,2} isequa<o$ constant

(b) $-\cos^2 x+C-\cos^4 x\cos 3x+C$ (d) $\cos 7x-\cos 4x+C$

A. constant

B. $-\cos^2 x+C$

C. $-\cos^4 x\cos 3x+C$

D. $\cos 7x-\cos 4x+C$

Answer: C

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Exercises (Multiple Correct Answers Type)

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

A. $2\sec^{-1}\sqrt{2e^x} + c$

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

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

D. $2\tan^{-1}\sqrt{2e^x - 1} + c$

Answer: A::B::D

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2. If $\int \sin x d(\sec x) = f(x) - g(x) + c, then \quad f(x) = \sec x$ (b) $f(x) = \tan x\ g(x) = 2x$ (d) $g(x) = x$

A. $f(x) = \sec x$

B. $f(x) = \tan x$

C. $g(x) = 2x$

D. $g(x) = x$

Answer: B::D

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3. Evaluate: $\int \sqrt{1 + \cos ecx} dx$

A. $2\sin^{-1}\sqrt{\sin x} + c$

B. $\sqrt{2}\cos^{-1}\sqrt{\cos x} + c$

C. $c - 2\sin^{-1}(1 - 2\sin x)$

D. $\cos^{-1}(1 - 2\sin x) + c$

Answer: A::D

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4. If $I = \int \sec^2 x \cos ec^4 x dx = A\cot^3 x + B\tan x + C\cot x + D,$ then find the values of A,B,C and D.

A. $A = -\frac{1}{3}$

B. $B = 2$

C. $C = -2$

D. none of these

Answer: A::C

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5. A curve $g(x) = \int x^{27}\left(1 + x + x^2\right)^6 \left(6x^2 + 5x + 4\right) dx$ is passing through origin. Then (a)$g(1) = \frac{3^7}{7}$ (b) $g(1) = \frac{2^7}{7}$ (c)$g(-1) = \frac{1}{7}$ (d) $g(-1) = \frac{3^7}{14}$

A. $g(1) = \frac{3^7}{7}$

B. $g(1) = \frac{2^7}{7}$

C. $g(-1) = \frac{1}{7}$

D. $g(-1) = \frac{3^7}{14}$

Answer: A::C

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6. If $\int \frac{\left(\sqrt{x}\right)^5}{\left(\sqrt{x}\right)^7 + x^6} dx = a \log\left(\frac{x^k}{1+x^k}\right) + c$ then a and k are

A. $k = -2, f(x) = \cot^{-1} x, g(x) = \sqrt{\text{cosec}x - 1}$

B. $k = -2, f(x) = \tan^{-1} x, g(x) = \sqrt{\text{cosec}x - 1}$

C. $k = 2, f(x) = \tan^{-1} x, g(x) = \frac{\cot x}{\sqrt{\text{cosec}x - 1}}$

D. $k = 2, f(x) = \cot^{-1} x, g(x) = \frac{\cot x}{\sqrt{\text{cosec}x + 1}}$

Answer: B::D

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7. If $I = \int \frac{\sin x + \sin^3 x}{\cos 2x} dx = P \cos x + Q \log|f(x)| + R,$ then $P = \frac{1}{2}, Q = -\frac{3}{4\sqrt{2}}$ (b) $P = \frac{1}{4}, Q = \frac{1}{\sqrt{2}}$ $f(x) = \frac{\sqrt{2}\cos x + 1}{\sqrt{2}\cos x - 1}$ (d) $f(x) = \frac{\sqrt{2}\cos x - 1}{\sqrt{2}\cos x + 1}$

A. $P = 1/2, Q = -\frac{3}{4\sqrt{2}}$

B. $P = 1/4, Q = -\frac{1}{\sqrt{2}}$

C. $f(x) = \frac{\sqrt{2}\cos x + 1}{\sqrt{2}\cos x - 1}$

D. $f(x) = \frac{\sqrt{2}\cos x - 1}{\sqrt{2}\cos x + 1}$

Answer: A::C

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8. If $\int \frac{e^{x-1}}{(x^2 - 5x + 4)} 2x dx = AF(x-1) + BF(x-4) + C$ and $F(x) = \int \frac{e^x}{x} dx$, *then*

A. $A = -2/3$

B. $B = (4/3)e^3$

C. $A = 2/3$

D. $B = (8/3)e^3$

Answer: A::D

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9. If $\int x^2 \dot{e}^{-2x} dx = e^{-2x}(ax^2 + bx + c) + d$, then the value of $\left|\frac{a}{bc}\right|$ is_____

A. $a = -\frac{1}{2}$

B. $b = \frac{1}{2}$

C. $c = -\frac{1}{4}$

D. $d \in R$

Answer: A::C::D

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10. $If \int \frac{x^4+1}{x^6+1}dx = \tan^{-1} f(x) - \frac{2}{3}\tan^{-1} g(x) + C, then$

a) both $f(x) and g(x)$ are odd functions

$b) f(x)$ is monotonic function

$c) f(x) = g(x)$ has no real roots

$d) \int \frac{f(x)}{g(x)}dx = -\frac{1}{x} + \frac{3}{x^3} + c$

A. both $f(x)$ and $g(x)$ are odd functions

B. $f(x)$ is one-one function

C. $f(x) = g(x)$ has no real roots

D. $\int \frac{f(x)}{g(x)}dx = \frac{1}{x} + \frac{3}{x^3} + c$

Answer: A::C::D

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11. If $\int \frac{x^2 - x + 1}{(x^2+1)^{\frac{3}{2}}} e^x dx = e^x f(x) + c$, then (a) $f(x)$ is an even function (b) $f(x)$ is a bounded function (c) the range of $f(x)$ is $(0, 1)$ (d) $f(x)$ has

two points of extrema

A. $f(x)$ is an even function

B. $f(x)$ is a bounded function

C. the range of $f(x)$ is (0, 1]

D. $f(x)$ has two points of extrema

Answer: A::B::C

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12. If $\int \frac{\cos 4x + 1}{\cot x - \tan x} dx = A \cos 4x + B$, *then* (a) $A = -\frac{1}{8}$ (b) $B = \frac{1}{2}$ (c) $A = -\frac{1}{4}$ (d) None of this

A. $A = -\frac{1}{8}$

B. $B = \frac{1}{2}$

C. $f(x)$ has fundamental period $\frac{\pi}{2}$

D. $f(x)$ is an odd function

Answer: A::C

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13. If

$$\int \sin^{-1} x \cos^{-1} x dx = f^{-1}(x)\left[\frac{\pi}{2}x - xf^{-1}(x) - 2\sqrt{1-x^2}\right] + 2x + C, t$$

$(a) f(x) = \sin x$

$(b) f(x) = \cos x$

$(c) f(x) = \tan x$

(d) none of these

A. $f(x) = \sin x$

B. $f(x) = \cos x$

C. $A = \frac{\pi}{4}$

D. $A = \frac{\pi}{2}$

Answer: A::D

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14. If $f(x) = \int \frac{x^8 + 4}{x^4 - 2x^2 + 2} dx and f(0) = 0, then \ f(x)$ is an odd function $f(x)$ has range R $f(x)$ has at least one real root $f(x)$ is a monotonic function.

A. $f(x)$ is an odd function

B. $f(x)$ has range R

C. $f(x)$ has at least one real root

D. $f(x)$ is a monotonic function

Answer: A::B::C::D

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15. If $\int \frac{dx}{x^2 + ax + 1} = f(g(x)) + c,$ then $f(x)$ is inverse trigonometric function for $|a| > 2$ $f(x)$ is logarithmic function for $|a| < 2$ $g(x)$ is quadratic function for $|a| > 2$ $g(x)$ is rational function for $|a| < 2$

A. $f(x)$ is inverse trigonometric function for $|a| < 2$

B. $f(x)$ is logarithmic function for $|a| > 2$

C. $g(x)$ is quadratic function for $|a| < 2$

D. $g(x)$ is rational function for $|a| > 2$

Answer: A::B::D

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16. If $\int \frac{(1-x^7)}{x(1+x^7)}dx = P\log|x| + Q\log|x^7+1| + c$

A. $a = 1$

B. $a = -1$

C. $b = \frac{2}{7}$

D. $b = -\frac{2}{7}$

Answer: A::D

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17. If $\int \frac{3\sin x + 2\cos x}{3\cos x + 2\sin x} dx = ax + b\ln|2\sin x + 3\cos x| + C$, then (a) $a = -\frac{12}{13}, b = \frac{15}{39}$ (b) $a = -\frac{7}{13}, b = \frac{6}{13}$ (c) $a = \frac{12}{13}, b = \frac{15}{39}$ (d) $a = -\frac{7}{13}, b = -\frac{6}{13}$

A. $a = -\frac{12}{13}$

B. $b = \frac{6}{13}$

C. $a = \frac{12}{13}$

D. $b = -\frac{15}{39}$

Answer: C::D

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Exercises (Linked Comprehension Type)

1. $y = f(x)$ is a polynomial function passing through point (0, 1) and which increases in the intervals $(1, 2)$ and $(3, \infty)$ and decreases in the

intervals $(\infty, 1)$ and $(2, 3)$.

If $f(1) = -8$, then the value of $f(2)$ is

A. -3

B. -6

C. -20

D. -7

Answer: D

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2. $y = f(x)$ is a polynomial function passing through point (0, 1) and which increases in the intervals $(1, 2)$ and $(3, \infty)$ and decreases in the intervals $(\infty, 1)$ and $(2, 3)$.

If $f(1) = -8$, then the value of $f(2)$ is

A. $[3, \infty)$

B. $[-8, \infty)$

C. $[-7, \infty)$

D. $(-\infty, 6]$

Answer: B

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3. $y = f(x)$ is a polynomial function passing through point (0, 1) and which increases in the intervals $(1, 2)$ and $(3, \infty)$ and decreases in the intervals $(\infty, 1)$ and $(2, 3)$.

If $f(x) = 0$ has four real roots, then the range of values of leading coefficient of polynomial is

A. [4/9, 1/2]

B. [4/9, 1]

C. [1/3, 1/2]

D. none of these

Answer: A

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4. If e^A is defined as $e^A = I + A + \frac{A^2}{2!} + \frac{A^3}{3!} + \ldots = \frac{1}{2}\begin{bmatrix} f(x) & g(x) \\ g(x) & f(x) \end{bmatrix}$, where $A = \begin{bmatrix} x & x \\ x & x \end{bmatrix}$, $0 < x < 1$ and 1 is identity matrix, then find the functions f(x) and g(x).

A. $\log\left(e^x + e^{-x}\right) + c$

B. $\log\left|e^x - e^{-x}\right| + c$

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

D. none of these

Answer: A

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5. If e^A is defined as $e^A = I + A + \frac{A^2}{2!} + \frac{A^3}{3!} + \ldots = \frac{1}{2}\begin{bmatrix} f(x) & g(x) \\ g(x) & f(x) \end{bmatrix}$, where $A = \begin{bmatrix} x & x \\ x & x \end{bmatrix}$, $0 < x < 1$ and 1 is identity matrix, then find the

functions f(x) and g(x).

A. $\frac{e^x}{2}(\sin x - \cos x)$

B. $\frac{e^{2x}}{5}(2\sin x - \cos x)$

C. $\frac{e^x}{5}(\sin 2x - \cos 2x)$

D. none of these

Answer: B

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6. If e^A is defined as $e^A = I + A + \frac{A^2}{2!} + \frac{A^3}{3!} + \ldots = \frac{1}{2}\begin{bmatrix} f(x) & g(x) \\ g(x) & f(x) \end{bmatrix}$, where $A = \begin{bmatrix} x & x \\ x & x \end{bmatrix}, 0 < x < 1$ and 1 is identity matrix, then find the functions f(x) and g(x).

A. $\frac{1}{2\sqrt{e^x - 1}} - \text{cosec}^{-1}(e^x) + c$

B. $\frac{2}{\sqrt{e^x - e^{-x}}} - \sec^{-1}(e^x) + c$

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

D. none of these

Answer: C

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7. Euler's substitution:

Integrals of the form $\int R\left(x, \sqrt{ax^2+bx+c}\right)dx$ are claculated with the aid of one of the following three Euler substitutions:

i. $\sqrt{ax^2+bx+c} = t \pm x\sqrt{a}$ if $a > 0$

ii. $\sqrt{ax^2+bx+c} = tx \pm x\sqrt{c}$ if $c > 0$

iii. $\sqrt{ax^2+bx+c} = (x-a)t$ if $ax^2+bx+c = a(x-a)(x-b)$

i.e., if α is real root of $ax^2+bx+c=0$

$\frac{xdx}{\sqrt{7x-10-x^2}^3}$ can be evaluated by substituting for x as

A. $\log_e|t+1|$

B. $\log_e|t+2|$

C. $\frac{1}{t+2}$

D. none of these

Answer: D

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8. Euler's substitution:

Integrals of the form $\int R\left(x, \sqrt{ax^2+bx+c}\right)dx$ are claculated with the aid of one of the following three Euler substitutions:

i. $\sqrt{ax^2+bx+c} = t \pm x\sqrt{a} \quad \text{if} \quad a > 0$

ii. $\sqrt{ax^2+bx+c} = tx \pm x\sqrt{c} \quad \text{if} \quad c > 0$

iii. $\sqrt{ax^2+bx+c} = (x-a)t \quad \text{if} \quad ax^2+bx+c = a(x-a)(x-b)$

i.e., if α is real root of $ax^2+bx+c=0$

$\frac{xdx}{\sqrt{7x-10-x^2}^3}$ can be evaluated by substituting for x as

A. x=(5+ 2 t^2)/(t^2 +1)

B. x=(5 - t^2)/(t^2 +2)

C. x=(2 t^2 - 5)/(3t^2 -1)

D. none of these

Answer: B

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9. Euler's substitution:

Integrals of the form $\int R\left(x, \sqrt{ax^2+bx+c}\right)dx$ are claculated with the aid of one of the following three Euler substitutions:

i. $\sqrt{ax^2+bx+c} = t \pm x\sqrt{a}$ if $a > 0$

ii. $\sqrt{ax^2+bx+c} = tx \pm x\sqrt{c}$ if $c > 0$

iii. $\sqrt{ax^2+bx+c} = (x-a)t$ if $ax^2+bx+c = a(x-a)(x-b)$

i.e., if α is real root of $ax^2+bx+c=0$

$\frac{xdx}{\sqrt{7x-10-x^2}^3}$ can be evaluated by substituting for x as

A. $x = \frac{5+2t^2}{t^2+1}$

B. $x = \frac{5-t^2}{t^2+2}$

C. $x = \frac{2t^2-5}{3t^2-1}$

D. none of these

Answer: A

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10. Let $f(x)=\int \frac{x^2 dx}{(1+x^2)\left(1+\sqrt{x^2+1}\right)} and f(0)=0.$ Then value of $f(1)$ will be (a) $\frac{7}{11}\left(tan\frac{\theta}{2}\right)^{\frac{11}{7}}+C$ (b) $\frac{7}{11}\left(\frac{\cos\theta}{2}\right)^{\frac{11}{7}}+C$ (c) $\frac{7}{11}\left(\frac{\sin\theta}{2}\right)^{\frac{11}{7}}+C$ (d)none of these

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

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

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

D. none of these

Answer: B

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11. Let $f(x)=\int\frac{x^2dx}{(1+x^2)\left(1+\sqrt{x^2+1}\right)}andf(0)=0.$ Then value of $f(1)$ will be (a) $\frac{7}{11}\left(tan\frac{\theta}{2}\right)^{\frac{11}{7}}+C$ (b) $\frac{7}{11}\left(\frac{\cos\theta}{2}\right)^{\frac{11}{7}}+C$ (c) $\frac{7}{11}\left(\frac{\sin\theta}{2}\right)^{\frac{11}{7}}+C$ (d)none of these

A. an increasing function

B. a decreasing function

C. a non-monotonic function

D. can't say anything

Answer: A

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12. If $\int\frac{x(x-1)}{(x^2+1)(x+1)\sqrt{x^3+x^2+x}}dx$
$=\frac{1}{2}\log_e\left|\frac{\sqrt{f(x)}-1}{\sqrt{f(x)}+1}\right|-\tan^{-1}\sqrt{f(x)}+C,$ then
The value of $f(1)$ is

A. 1

B. 2

C. 3

D. 4

Answer: C

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

$= \frac{1}{2}\log_e\left|\frac{\sqrt{f(x)}-1}{\sqrt{f(x)}+1}\right| - \tan^{-1}\sqrt{f(x)} + C$, then

The value of $\lim_{x\to\infty} \tan^{-1}\sqrt{f(x)}$ is

A. $\pi/2$

B. $\pi/4$

C. π

D. 2π

Answer: A

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14. If a function satisfies the relation $f(x)f''(x) - f(x)f'(x) = (f'(x))^2 \forall x \in R$ and $f(0) = f'(0) = 1$, then

The value of $\lim_{x \to -\infty} f(x)$ is

A. $\frac{1}{\sqrt{e}}$

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

C. $\sqrt{e}$

D. e

Answer: B

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15. If a function satisfies the relation $f(x)f''(x) - f(x)f'(x) = (f'(x))^2 \forall x \in R$ and $f(0) = f'(0) = 1$, then

Number of roots of the equation $f(x) = e^x$ is

A. 0

B. 1

C. 2

D. infinite

Answer: B

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16. Consider two differentiable functions $f(x), g(x)$ satisfying $6\int f(x)g(x)dx = x^6 + 3x^4 + 3x^2 + c$ and $2\int \frac{g(x)dx}{f(x)} = x^2 + c$, where f

$\lim_{x \to 0} \frac{\log(f(x))}{g(x)} =$

A. $\frac{x^4}{4} - \frac{x^2}{2} + x + c$

B. $\frac{x^4}{4} + \frac{x^2}{2} - \frac{x^3}{3} + x + c$

C. $\frac{x^4}{4} - \frac{x^3}{3} + \frac{x^2}{2} - x + c$

D. $\frac{x^4}{4} + \frac{x^3}{3} + c$

Answer: B

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17. Consider two differentiable functions $f(x), g(x)$ satisfying

$6\int f(x)g(x)dx = x^6 + 3x^4 + 3x^2 + c$ and $2\int \frac{g(x)dx}{f(x)} = x^2 + c,$ where f

$\lim_{x \to 0} \frac{\log(f(x))}{g(x)} =$

A. e

B. 2

C. 1

D. 0

Answer: D

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EXERCISES (Matrix Match Type)

1. Match the following lists:

List I	List II
a. If $\int \frac{2^x}{\sqrt{1-4^x}}dx = k\sin^{-1}(f(x))+C$, then k is greater than	p. 0
b. If $\int \frac{(\sqrt{x})^5}{(\sqrt{x})^7+x^6}dx = a\ln\frac{x^k}{x^k+1}+c$, then ak is less than	q. 1

c. If $\int \frac{x^4+1}{x(x^2+1)^2}\,dx = k \ln\lvert x\rvert + \frac{m}{1+x^2} + n$, where n is the constant of integration, then mk is greater than	r. 3
d. If $\int \frac{dx}{5+4\cos x} = k\tan^{-1}\left(m\tan\frac{x}{2}\right)+C$, then k/m is greater than	s. 4

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2. Match the following lists:

List I	List II
a. $\int \frac{e^{2x}-1}{e^{2x}+1}\,dx$ is equal to	p. $x - \log\left[1+\sqrt{1-e^{2x}}\right]+c$
b. $\int \frac{1}{(e^x+e^{-x})^2}\,dx$ is equal to	q. $\log(e^x+1) - x - e^{-x} + c$
c. $\int \frac{e^{-x}}{1+e^x}\,dx$ is equal to	r. $\log(e^{2x}+1) - x + c$
d. $\int \frac{1}{\sqrt{1-e^{2x}}}\,dx$ is equal to	s. $-\frac{1}{2(e^{2x}+1)} + c$

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3. Match the following lists:

List I	List II
a. If $f(x)$ is an integrable function for $x \in \left[\frac{\pi}{6}, \frac{\pi}{3}\right]$ and $I_1 = \int_{\pi/6}^{\pi/3} \sec^2\theta f(2\sin 2\theta)\, d\theta$, and $I_2 = \int_{\pi/6}^{\pi/3} \operatorname{cosec}^2\theta f(2\sin 2\theta) d\theta$, then $I_1/I_2 =$	**p.** 3
b. If $f(x+1) = f(3+x)\ \forall\ x$, and the value of $\int_a^{a+b} f(x)dx$ is independent of a, then the value of b can be	**q.** 1
c. The value of $2\int_1^4 \frac{\tan^{-1}[x^2]}{\tan^{-1}[x^2]+\tan^{-1}[25+x^2-10x]}\, dx$ (where [.]denotes the greatest integer function) is	**r.** 2
d. If $I = \int_0^2 \sqrt{x+\sqrt{x+\sqrt{x+\cdots\infty}}}\, dx$ (where $x > 0$), then $[I]$ is equal to (where [.] denotes the greatest integer function)	**s.** 4

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4. Consider

$$\int \frac{x^3 + 3x^2 + 2x + 1}{\sqrt{x^2 + x + 1}} dx$$
$$= (ax^2 + bx + c)\sqrt{x^2 + x + 1} + \lambda \int \frac{dx}{\sqrt{x^2 + x + 1}}$$

Now, match the following lists and then choose the correct code.

List I	List II
a. The value of a	p. $-\frac{7}{24}$
b. The value of b	q. $\frac{1}{3}$
c. The value of c	r. $\frac{1}{16}$
d. The value of λ	s. $\frac{13}{12}$

Codes:

	a	b	c	d
(1)	q	p	s	r
(2)	s	p	q	r
(3)	r	q	p	s
(4)	q	s	p	r

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EXERCISES (Numerical Value Type)

1. Let $f(x) = \int x^{\sin x}\left(1 + x\cos x \ln x + \sin x\right)dx and f\left(\frac{\pi}{2}\right) = \frac{\pi^2}{4}$. Then the value of $|\cos(f(\pi))|$ is___

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2. Let $g(x) = \int \frac{1 + 2\cos x}{(\cos x + 2)^2}dx and g(0) = 0.$ then the value of $8g\left(\frac{\pi}{2}\right)$ is _____

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3. Let $k(x) = \int \frac{\left(x^2 + 1\right)dx}{\sqrt{x^3 + 3x + 6}} and k(-1) = \frac{1}{33}$. Then the value of $k(-2)$ is___

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4. If the value $\int \frac{1-(\cot x)^{2008}}{\tan x+(\cot x)^{2009}}dx=\frac{1}{k}\ln\left|\sin^k x+\cos^k x\right|+c$,then find k.

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5. If $f(x)=\int \frac{3x^2+1}{(x^2-1)^3}dx$ and $f(0)=0$, then the value of $\left|\frac{2}{f(2)}\right|$ is___

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6. If $f(x)=\sqrt{x}, g(x)=e^x-1$, and $\int fog(x)dx=Afog(x)+B\tan^{-1}(fog(x))+C$, then $A+B$ is equal to

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7. If $\int \frac{2\cos x-\sin x+\lambda}{\cos x+\sin x-2}dx=A\ln|\cos x+\sin x-2|+Bx+C$, then the value of $A+B+|\lambda|$ is_____

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8.

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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9. If $f(x) = \int \frac{dx}{x^{1/3}+2}$ and $f(0) = 12\log_e 2,$ then the value of $f(-1)$ is $-$.

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10.

If $I = \int \frac{dx}{\sqrt[3]{\sin^{11} x \cos x}} = -A(\tan x)^{-\frac{8}{3}} + B(\tan x)^{-\frac{2}{3}} + c,$ then find t

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Archives JEE MAIN (Single Correct Answer Type)

1. If the integral $\int \frac{5\tan x}{\tan x - 2} dx = x + aIn|\sin x - 2\cos x| + k$, then a is equal to

A. -1

B. -2

C. 1

D. 2

Answer: D

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2. If $\int f(x)dx = \psi(x)$, then $\int x^5 f(x^3)dx$

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

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

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

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

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

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

Answer: D

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5. The integral $\int \frac{2x^{12}+5x^9}{[x^5+x^3+1]^3}.dx$ is equal to-

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

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

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

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

Answer: A

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6. Let $I_n = \int \tan^n x dx, (n > 1)$. If $I_4 + I_6 = a \tan^5 x + bx^5 + C$, Where C is a constant of integration, then the ordered pair (a, b) is equal to :

A. $\left(-\frac{1}{5}, 0\right)$

B. $\left(-\frac{1}{5}, 1\right)$

C. $\left(\frac{1}{5}, 0\right)$

D. $\left(\frac{1}{5}, -1\right)$

Answer: C

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7. Evaluate: $\int \frac{\sin^2 x \cos^2 x}{\left(\sin^5 x + \cos^3 x \sin^2 x + \sin^3 x \cos^2 x + \cos^5 x\right)^2} dx$

A. $\frac{-1}{1+\cot^3 x}+C$

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

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

D. $\frac{1}{1+\cot^3 x}+C$

Answer: C

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Archives JEE ADVANCED (Single Correct Answer Type)

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

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

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

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

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

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

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

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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Single Correct Answer Type

1. Evaluate: $\int\frac{\cos 5x+\cos 4x}{1-2\cos 3x}\,dx$

A. $-\left(\frac{\sin 2x}{2}+\cos x\right)+C$

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

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

D. $-\left(\frac{\sin 2x}{2}+\sin x\right)+C$

Answer: D

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

A. $\frac{1}{2} \ln |\sec 2x + \tan 2x| + C$

B. $\ln |\sec x + \operatorname{cosec} x| + C$

C. $\ln |\sec x + \tan x| + C$

D. $\frac{1}{2} \ln |\sec x + \operatorname{cosec} x| + C$

Answer: A

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

A. $\frac{1}{2} e^x - \ln x + C$

B. $\frac{1}{2}\ln x - e^x + C$

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

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

Answer: C

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

(A) $-\frac{\cot^n x}{n} + c$

(B) $-\frac{\cot^n x}{n+1} + c$

(C) $\frac{\cot^n x}{n} + c$

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

A. $\frac{\cot^n x}{n}$

B. $\frac{-\cot^{n-1} x}{n-1}$

C. $\frac{-\cot^n x}{n}$

D. $\frac{\cot^{n-1} x}{n-1}$

Answer: C

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

A. 3

B. 6

C. 9

D. 12

Answer: C

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

A. $-\frac{2}{9}$

B. $-\frac{1}{9}$

C. $\frac{1}{9}$

D. 0

Answer: A

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

A. 6

B. 7

C. 8

D. none of these

Answer: C

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

A. $e^x + \sin x + 2x$

B. $e^x + \sin x$

C. $e^x - \sin x$

D. $e^x + \sin x + x$

Answer: B

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9. Evaluate: $\int \frac{x + x^{\frac{2}{3}} + x^{\frac{1}{6}}}{x\left(1 + x^{\frac{1}{3}}\right)} dx$ equals

A. $\frac{3x^{\frac{2}{3}}}{4} + 6\tan^{-1}\left(x^{\frac{1}{6}}\right) + C$

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

C. $\frac{3x^{\frac{2}{3}}}{10} + 6\tan^{-1}\left(x^{\frac{1}{6}}\right) + C$

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

Answer: B

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

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

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

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

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

Answer: A

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11. If $x^2 \neq n\pi - 1, n \in N.$ Then, the value of $\int x\sqrt{\frac{2\sin(x^2+1)-\sin 2(x^2+1)}{2\sin(x^2+1)+\sin 2(x^2+1)}}dx$ is equal to:

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

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

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

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

Answer: B

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

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

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

C. $\tan\left(1+\log\tan.\frac{x}{2}\right)+c$

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

Answer: C

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13. Evaluate: $\int \frac{dx}{x\sqrt{x^6-16}} =$

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

B. $\frac{1}{12}\sec^{-1}\left(\frac{x^3}{4}\right)+c$

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

D. none of these

Answer: B

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14. $\int \frac{dx}{\cos(2x)\cos(4x)}$ is equal to

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

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 these

Answer: B

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

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

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

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

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

Answer: C

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

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

B. $A=\sqrt{2}, f(x)=\cos x$

C. $A=\sqrt{2}, f(x)=x$

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

Answer: D

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

A. $-\sqrt{x\cos x}+C$

B. $\sqrt{x\sin x}+C$

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

D. $C-2\sqrt{x\cos x}$

Answer: C

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18. 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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19. 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

A. 4

B. 5

C. 6

D. none

Answer: B

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

A. $\frac{\sqrt{\tan x} e^{\sqrt{\sin x}}}{\sqrt{\cos x}} + C$

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

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

D. $\frac{\sqrt{\cot x} e^{\sqrt{\sin x}}}{2\sqrt{\cos x}} + C$

Answer: B

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

A. $\sec^{-1} x^3 + C$

B. $\frac{1}{6} \log \left(\frac{\sqrt{x^6+1}-1}{\sqrt{x^6+1}+1} \right) + C$

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

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

Answer: B

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22. $\int \frac{dx}{(1+\sqrt{x})^{2010}} = 2\left[\frac{1}{\alpha(1+\sqrt{x})^{\alpha}} - \frac{1}{(\beta(1+\sqrt{x}))^{\beta}}\right] + c$ where $\alpha, \beta > 0$ then $\alpha - \beta$ is

A. 1

B. 2

C. -1

D. -2

Answer: A

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

A. $[-1,1]$

B. $[-\sqrt{2},\sqrt{2}]$

C. $[0,1]$

D. $[-1,0]$

Answer: A

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

A. -1

B. -2

C. 1

D. 2

Answer: B

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

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

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

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

D. $\cos^{-1}\sqrt{x-\frac{1}{x}+2}+c$

Answer: A

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

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

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

C. $C - \frac{\sqrt{16-x^2}}{16x}$

D. $\frac{\sqrt{16-x^2}}{16x} + C$

Answer: C

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

A. 2

B. 3

C. 6

D. 8

Answer: C

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

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

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

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

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

Answer: A

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

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

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

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

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

Answer: B

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

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

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

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

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

Answer: C

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

A. $-1/2$

B. $1/4$

C. $1/2$

D. $-1/4$

Answer: B

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

A. $\frac{1}{a^4}\left[\frac{1}{x}\sqrt{a^2 + x^2} - \frac{1}{3x^2}\sqrt{a^2 + x^2}\right] + c$

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

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

D. $\frac{1}{a^4}\left[\frac{1}{x}\sqrt{a^2+x^2}-\frac{1}{3x^3}\sqrt{a^2+x^2}\right]+c$

Answer: C

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33. If $I=\int x^{27}\left(6x^2+5x+4\right)\left(x^2+x+1\right)^6 dx=f(x)+C$, then f(x) is equal to

A. $\frac{x^4\left(1+x+x^2\right)^7}{7}+C$

B. $\frac{x^{28}\left(1+x+x^2\right)^7}{7}+C$

C. $\frac{x^{28}\left(1+x+x^2\right)^7}{28}+C$

D. None

Answer: B

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34. $\int \frac{x^2(1-\log x)}{(\log x)^4 - x^4} dx$ equals

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

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

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

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

Answer: B

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35.

$$\int \frac{x(x-1)}{(x^2+1)(x+1)\sqrt{x^3+x^2+x}} = \frac{1}{2}\log\left|\frac{\sqrt{x+\frac{1}{x}+1}-1}{\sqrt{x+\frac{1}{x}+1}+1}\right| - A + c.$$

Then the value of A is equal to

A. $\cos^{-1}\sqrt{1+\frac{1}{x}}$

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

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

D. $\sin^{-1}\sqrt{x+\frac{1}{x}+1}$

Answer: B

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

A. $\frac{3}{n}\ln\left(\frac{x^n}{x^n+1}\right)$

B. $\frac{1}{n}\ln\left(\frac{x^n}{x^n+1}\right)$

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

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

Answer: A

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

A. $\log_e x + c$

B. $\log_e x + 2\tan^{-1} x + c$

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

D. $\log_e \{x(x^2+1)\} + c$

Answer: B

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

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

B. $\frac{1}{6}\tan^{-1} . \frac{(x^2+1)^2}{2} + C$

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

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

Answer: A

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

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

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

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

D. $\frac{1}{4}\ln(1+x^4)+\ln(1+x)+c$

Answer: C

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

A. $\log_e|\sin x|+\sin x+C$

B. $\log_e|\sin x| - \sin x + C$

C. $-\log_e|\sin x| - \sin x + C$

D. $-\log_e|\sin x| + \sin x + C$

Answer: B

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

A. $x - \log_e|x| + \log_e\left(x^2 + 1\right) - \tan^{-1} x + C$

B. $x - \log_e|x| + \frac{1}{2}\log_e\left(x^2 + 1\right) - \tan^{-1} x + C$

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

D. none of these

Answer: B

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

A. $\frac{1}{2\ \text{cosec x}+\cot x}+C$

B. $2\ \text{cosec x}+\cot x+C$

C. $\frac{1}{2\ \text{cosec x}-\cot x}+C$

D. $2\ \text{cosec x}-\cot x+C$

Answer: A

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

A. $g^{-1}(x)+C$

B. $xf^{-1}+C$

C. $xf^{-1}(x)-g\left(f^{-1}(x)\right)+C$

D. $f^{-1}(x) + C$

Answer: C

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44. $\int \frac{e^{\cot x}}{\sin^2 x}(2 \ln \operatorname{cosec} x + \sin 2x)dx$

A. $2e^{\cot x} \ln|\sin x| + c$

B. $2e^{\tan x} \ln|\sin x| + c$

C. $2e^{\cot x} \ln|\cos x| + c$

D. $2e^{\tan x} \ln|\cos x| + c$

Answer: A

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

A. $\sin x$

B. $\cos x$

C. $\tan x$

D. $\cot x$

Answer: C

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

A. $e\left(\frac{\pi}{4} - \frac{1}{2}\right) + 1$

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

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

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

Answer: A

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47. $\int \frac{e^x(x-1)(x-\ln x)}{x^2}dx$ is equal to

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

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

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

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

Answer: D

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48. $\int(\sin(101x).\sin^{99}x)dx$ equals

A. $\frac{\sin(100x)(\sin x)^{100}}{100}+C$

B. $\frac{\cos(100x)(\sin x)^{100}}{100}+C$

C. $\frac{\cos(100x)(\cos x)^{100}}{100} + C$

D. $\frac{\cos(100x)(\cos x)^{100}}{100} + C$

Answer: A

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Subjective Type

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

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

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3. Evaluate: $\int \cos 2x \ \ln \ (1+\tan x)dx$

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

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

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

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Comprehension Type

1. Let $f(x)=\int\frac{dx}{e^x+8e^{-x}+4e^{-3x}}, g(x)=\int\frac{dx}{e^{3x}+8e^x+4e^{-x}}$. $\int(f(x)-2g(x))dx$

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

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

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

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

Answer: D

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2. Let $f(x)=\int\frac{dx}{e^x+8e^{-x}+4e^{-3x}}, g(x)=\int\frac{dx}{e^{3x}+8e^x+4e^{-x}}$. $\int(f(x)-2g(x))dx$

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

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

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

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

Answer: B

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Multiple Correct Answer Type

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

A. (a) $u=e^x+e^{-x}$

B. (b) $u=e^x-e^{-x}$

C. (c) $t=e^x+e^{-x}$

D. (d) $t=e^x-e^{-x}$

Answer: B::C

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

A. $f(x) = x - 1$

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

C. $g(x) = \frac{\sqrt{1+e^x} + 1}{\sqrt{1+e^x} - 1}$

D. $f(x) = 2(x - 2)$

Answer: B::D

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