

MATHS

BOOKS - CENGAGE MATHS (ENGLISH)

INDEFINITE INTEGRATION

ILLUSTRATION

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



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



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



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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: $\int \tan^{-1} \left\{ \sqrt{\left(\frac{1 - \cos x}{2 + \cos 2x} \right)} \right\} dx$



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



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



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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 $\int \sin 2x \sin 3x \, dx$.



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14. Evaluate: $\int \frac{dx}{(2x - 7)(x - 7)(x - 4)}$



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15. Find the values of a and b such that $\int \frac{dx}{1 + \sin x} = \tan\left(\frac{x}{2} + a\right) + b$



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16. Evaluate the following:

(i) $\int \frac{\sec^2 x}{3 + \tan x} dx$ (ii) $\int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx$
(iii) $\int \frac{1 - \tan x}{1 + \tan x} dx$ (iv) $\int \frac{1}{1 + e^{-x}} dx$



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17. Evaluate the following :

(i) $\int \left(x + \frac{1}{x} \right)^{3/2} \left(\frac{x^2 - 1}{x^2} \right) dx$ (ii) $\int \frac{\sqrt{2 + \log x}}{x} dx$
(iii) $\int \frac{(\sin^{-1} x)^3}{\sqrt{1 - x^2}} dx$ (iv) $\int \frac{\cot x}{\sqrt{\sin x}} dx$



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



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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: $\int \tan^4 x dx$



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



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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: $\int \frac{2x - \sqrt{\sin^{-1} x}}{\sqrt{1-x^2}} dx.$



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



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



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



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



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



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



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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: $\int \sin(e^x) d(e^x)$



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



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



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



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



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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 $\int \frac{1}{\sqrt{e^{5x}} \sqrt[4]{(e^{2x} + e^{-2x})^3}} dx$.



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46. Find $\int \sin^5 x dx$.



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



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



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



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



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



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



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



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



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



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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: $\int \frac{4x + 1}{x^2 + 3x + 2} dx$



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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: $\int \sqrt{\tan \theta} d\theta$



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



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



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



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



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69. Evaluate: $\int \sqrt{\sec x - 1} dx$



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



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



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



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



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



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



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



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



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



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



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



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89. Evaluate: $\int \frac{(\log_e x)^e \log_e^2 x \log_e^3 x}{x} dx$



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



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96. Evaluate: $\int (x)$ is polynomial function of the nth degree, prove that $- \int e^x f(x) dx = e^x \left[f(x) f'(x) + f''(x) + \dots + (-1)^n f^{(n)}(x) \right]$ Where $f^{(n)}(x) de - es \frac{d^n f}{dx^n}$



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



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



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



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



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



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



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



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



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



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



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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 $m \in N$,

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



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



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18. $\int (\sin(101x) \cdot \sin^{99} x) dx$ 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 $\int (1 - \cos x) \operatorname{cosec}^2 x dx$



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



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



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



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6. Evaluate: (i) $\int \frac{(x^3 + 8)(x - 1)}{x^2 - 2x + 4} dx$ (ii) $\int (a \tan x + b \cot x)^2 dx$



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7. Solve the following integration

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



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



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



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



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



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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: (i) $\int \{1 + \tan x \tan(x + \theta)\} dx$ (ii)
$$\int \frac{\sin 2x}{\sin\left(x - \frac{\pi}{6}\right) \sin\left(x + \frac{\pi}{6}\right)} dx$$



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

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

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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 $\int \operatorname{cosec}^4 x dx$



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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. $I = \int \frac{dx}{(2ax + x^2)^{\frac{3}{2}}}$



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CONCEPT APPLICATION EXERCISE 7.4

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



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2. Evaluate: $\int \frac{x^2 \tan^{-1} x^3}{1 + x^6} dx$



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



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



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



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



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12. Evaluate $\int \sin^3 x \cos^2 x dx$



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



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



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



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



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17. Evaluate: $\int \frac{(x^4 - x)^{1/4}}{x^5} dx$



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



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



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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: $\int \frac{e^x}{e^{2x} + 6e^x + 5} dx$



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



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



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



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



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



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



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5. Evaluate: $\int \frac{x^{\frac{5}{2}}}{\sqrt{1+x^7}} dx$



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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: $\int \frac{dx}{9 + 16 \sin^2 x}$



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



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



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



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



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



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CONCEPT APPLICATION EXERCISE 7.9

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



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



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



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



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



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



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



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



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



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



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15. Evaluate $\int \sqrt{x^2 + 2x + 5} dx$



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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. $A = -1/2$

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

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

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

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

Answer: A



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

A. $\cos x + \frac{1}{2} \cos 2x - \frac{1}{3} \cos 3x + C$

B. $\cos x - \frac{1}{2}\cos 2x - \frac{1}{3}\cos 3x + C$

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

D. $\cos x - \frac{1}{2}\cos 2x + \frac{1}{3}\cos 3x + C$

Answer: B



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6.

If $\int \sqrt{1 + \sin x} f(x) dx = \frac{2}{3}(1 + \sin x)^{3/2} + C$, then $f(x)$ equals

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

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

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

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

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

Answer: D



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8.

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

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

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

$$\frac{1}{\sqrt{2}} \left(\sin x + \cos x + \frac{1}{2} \log |\cos ec x - \cos x| \right)$$

$$\frac{1}{2} [\sin x - \cos x] - \frac{1}{\sqrt{2}} \log |\cos ec(x + \frac{\pi}{4})|$$

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

Answer: D



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

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

Answer: D



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

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. If $I = \int \sqrt{\frac{5-x}{2+x}} dx$, then I equals

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

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

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

Answer: A



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14. Evaluate: $\int \frac{1}{\sqrt{\sin^3 x \sin(x + \alpha)}} dx, \alpha \neq n\pi, n \in Z$

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

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

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

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

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

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

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

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

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

Answer: C



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

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

D. non of these

Answer: C



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

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

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

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

D. non of these

Answer: C



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

then $f(x)$ is:

- A. $\frac{x^{6m} + x^{2m}}{2m(x^{2m} + x^m + 1)^2} + c$
- B. $\frac{x^{4m}}{2m(x^{2m} + x^m + 1)^2} + c$
- C. $\frac{2mx^{4m}}{(x^{2m} + x^m + 1)^2} + c$
- D. $\frac{mx^{5m}}{2(x^{2m} + x^m + 1)^2} + c$

Answer: B



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20. If $l^r(x)$ means $\log \log \log \dots x$ being repeated r times, then

$\int [(xl(x)l^2(x)l^3(x)\dots l^r(x)]^{-1} dx$ is equal to :

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

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

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

D. none of these

Answer: A



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21. Find $\int [\sqrt{\cot x} + \sqrt{\tan x}] dx$

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

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

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

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

Answer: B



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22. If $I = \int \frac{\sin 2x}{(3 + 4 \cos x)^3} dx$, then I equals

- 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 equal to

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

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

Answer: A



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

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

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

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

- 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 :

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

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

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

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

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

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

D. none of these

Answer: C



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36. $\int x \left(\left(\frac{\ln a^{\frac{x}{2}}}{3a^{\frac{5x}{2}} b^{3x}} + \frac{\ln b^b \wedge x}{2a^{2x} b^{4x}} \right) dx \right)$ (where $a, b \in R^+$) is equal to

$$\frac{1}{6 \ln a^2 b^3} a^{2x} b^{3x} \frac{\ln(a^{2x} b^{3x})}{e} + k \quad \frac{1}{6 \ln a^2 b^3} \frac{1}{a^{2x} b^{3x}} \frac{\ln 1}{ea^{2x} b^{3x}} + k$$
$$\frac{1}{6 \ln a^2 b^3} \frac{1}{a^{2x} b^{3x}} \ln(a^{2x} b^{3x}) + k - \frac{1}{6 \ln a^2 b^3} \frac{1}{a^{2x} b^{3x}} \ln(a^{2x} b^{3x}) + k$$

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

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

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

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

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 $\int \frac{xf'(x) - 2f(x)}{\sqrt{x^4f(x)}} dx$ 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) $\frac{7}{11} \left(\frac{\cos \theta}{2} \right)^{\frac{11}{7}} + C$

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

(d) none of these

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

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

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 $\int \frac{dx}{\cos^3 x \sqrt{\sin 2x}} = a(\tan^2 x + b)\sqrt{\tan x} + c$

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.

If

$$\int \frac{dx}{(x+2)(x^2+1)} = a \log|1+x^2| + b \tan^{-1} x + \frac{1}{5} \log|x+2| + C,$$

then

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

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

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

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

Answer: C



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43. If $\int \frac{3e^x - 5e^{-x}}{4e^x + 5e^{-x}} dx = ax + b \ln(4e^x + 5e^{-x}) + C$, 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. $\int \frac{x^9}{(4x^2 + 1)^6} dx$ is equal to

A. $\frac{1}{5x} \left(4 + \frac{1}{x^2} \right)^{-5} + C$

B. $\frac{1}{5} \left(4 + \frac{1}{x^2} \right)^{-5} + C$

C. $\frac{1}{10} (1 + 4x^2)^{-5} + C$

$$D. \frac{1}{10} \left(4 + \frac{1}{x^2} \right)^{-5} + C$$

Answer: D



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46. If $\int \frac{1}{x\sqrt{1-x^3}} dx = a \log \left| \frac{\sqrt{1-x^3}-1}{\sqrt{1-x^3}+1} \right| + b$, then a is equal

A. $1/3$

B. $2/3$

C. $-1/3$

D. $-2/3$

Answer: A



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

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

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

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

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

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

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

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

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

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

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

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

Answer: A



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52. $\int \frac{1 + 2x^6}{(1 - x^6)^{3/2}} dx$ 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 $\int \frac{2x^{12} + 5x^9}{[x^5 + x^3 + 1]^3} dx$ 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. $\frac{(\ln x)^n}{x} + C$
- B. $x(\ln x)^{n-1} + C$
- C. $x(\ln x)^n + C$
- D. none of these

Answer: C



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55. $\int e^x \{f(x) - f'(x)\} dx = \phi(x)$, 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. $x \tan^{-1} x - I n |\sec(\tan^{-1} x)| + c$
- B. $x \tan^{-1} x + I n |\sec(\tan^{-1} x)| + c$
- C. $x \tan^{-1} x - I n |\cos(\tan^{-1} x)| + c$

D. none of these

Answer: D



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57.

If

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

then

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. If $\int xe^x \cos x dx = ae^x(b(1-x)\sin x + cx\cos x) + d$, then

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

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

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

D. $a = \frac{1}{2}, b = 1, c = -1$

Answer: B



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

- A. $\frac{1}{2} [\sec^2 x - \tan x] + c$
- B. $\frac{1}{2} [x \sec^2 x - \tan x] + c$
- C. $\frac{1}{2} [x \sec^2 x + \tan x] + c$
- D. $\frac{1}{2} [\sec^2 x + \tan x] + c$

Answer: B



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62. $\int e^{\tan^{-1} x} (1 + x + x^2) d(\cot^{-1} x)$ 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

Answer: B



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

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

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

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

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

Answer: D



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

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

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

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

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. $\int e^{\tan x} (\sec x - \sin x) dx$ is equal to

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. $\int \frac{\cos ec^2 x - 2005}{\cos^{2005} x} \cdot dx$

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

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

Answer: A



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

$$\frac{1}{x^2 - f(x)} + c \quad (\text{b}) \quad \frac{1}{x^2 + f(x)} + c \quad (\text{c}) \quad \frac{1}{x - f(x)} + c \quad (\text{d}) \quad \frac{1}{x + f(x)} + c$$

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

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

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

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

D. none of these

Answer: C



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

Answer: D



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

- A. $\frac{1}{2} \ln \left| \frac{2 + \sin x - \cos x}{2 - \sin x + \cos x} \right| - \frac{1}{\sqrt{2}} \tan^{-1} \left(\frac{\sin x + \cos x}{\sqrt{2}} \right) + c$
- B. $\frac{1}{2} \ln \left| \frac{2 + \sin x - \cos x}{2 - \sin x + \cos x} \right| - \frac{1}{2\sqrt{2}} \tan^{-1} \left(\frac{\sin x + \cos x}{\sqrt{2}} \right) + c$
- C. $\frac{1}{4} \ln \left| \frac{2 + \sin x - \cos x}{2 - \sin x + \cos x} \right| - \frac{1}{\sqrt{2}} \tan^{-1} \left(\frac{\sin x + \cos x}{\sqrt{2}} \right) + c$
- D. none of these

Answer: C



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76. $4 \int \frac{\sqrt{a^6 + x^8}}{x} dx$ is equal \rightarrow (a)

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

$$(b) \quad a^6 \ln \left| \frac{\sqrt{a^6 + x^8} - a^3}{\sqrt{a^6 + x^8} + a^3} \right| + c$$

$$(c) \sqrt{a^6 + x^8} + \frac{a^3}{2} \ln \left| \frac{\sqrt{a^6 + x^8} - a^3}{\sqrt{a^6 + x^8} + a^3} \right| + c$$

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

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

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

Answer: C



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77. If $I_{m,n} = \int \cos^m x \sin nx dx$, then $7I_{4,3} - 4I_{3,2}$ is equal to a constant

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

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

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

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. $\int \sqrt{1 + \cos ex} dx$ equals (a) $2 \sin^{-1} \sqrt{\sin x} + c$ (b) $\sqrt{2} \cos^{-1} \sqrt{\cos x} + c$

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

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 $l = \int \sec^2 x \cos ec^4 x dx = A \cot^3 x + B \tan x + C \cot x + D$, then
 $A = -\frac{1}{3}$ (b) $B = 2$ (C) $= -2$ (d) none of these

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 $g(x) = \int x^{27} (1 + x + x^2)^6 (6x^2 + 5x + 4) dx$ 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 $\int \frac{(\sqrt{x})^5}{(\sqrt{x})^7 + x^6} dx = a \log\left(\frac{x^k}{1+x^k}\right) + c$ then a and k are

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

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

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

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

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 $\int x^2 e^{-2x} dx = e^{-2x} (ax^2 + bx + c) + d$ then

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 both $f(x)$ and $g(x)$ are odd functions $f(x)$ is monotonic function $f(x) = g(x)$

has no real roots $\int \frac{f(x)}{g(x)} dx = -\frac{1}{x} + \frac{3}{x^3} + c$

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 $\int \frac{\cos 4x + 1}{\cot x - \tan x} dx = Af(x) + B$, then

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 $\int \sin^{-1} x \cos^{-1} x dx = f^{-1}(x)$

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

$f(x) = \cos x$ A = $\frac{\pi}{4}$ (d) A = $\frac{\pi}{2}$

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 \mathbb{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 \mathbb{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

- 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 $\int \frac{1 - x^7}{x(1 + x^7)} dx = a \log_e|x| + b \log_e|x^7 + 1| + c$, then

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 $\int \frac{3 \sin x + 2 \cos x}{3 \cos x + 2 \sin x} dx = ax + b \log_e |2 \sin x + 3 \cos x| + c$ then a.
 $a = -\frac{12}{13}$ b. $b = \frac{6}{13}$ c. $a = \frac{12}{13}$ d. $b = -\frac{15}{39}$

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 range of $f(x)$ is (a) $[3, \infty)$ (b) $[-8, \infty)$ (c) $[-7, \infty)$ (d) $(-\infty, 6]$

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 A is square matrix and e^A is defined as

$$e^A = I + A + \frac{A^2}{2!} + \frac{A^3}{3!} + \dots = \frac{1}{2} \begin{bmatrix} f(x) & g(x) \\ g(x) & f(x) \end{bmatrix}, \text{ where}$$

$A = \begin{bmatrix} x & x \\ x & x \end{bmatrix}$ and $0 < x < 1$, I is an identity matrix.

$\int (g(x) + 1) \sin x dx$ is equal to

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

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

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

D. none of these

Answer: A



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5. If A is a square matrix and e^a is defined as

$$e^A = 1 + \frac{A^2}{2!} + \frac{A^3}{3!} + \dots + \infty = \frac{1}{2} [f(x), g(x); g(x), f(x)],$$

where $A = \begin{bmatrix} x & x \\ x & x \end{bmatrix}$. and I being the identity matrix then $\int \frac{g(x)}{f(x)} dx =$

- 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 A is square matrix and e^A is defined as

$$e^A = I + A + \frac{A^2}{2!} + \frac{A^3}{3!} + \dots = \frac{1}{2} \begin{bmatrix} f(x) & g(x) \\ g(x) & f(x) \end{bmatrix}, \text{ where}$$

$A = \begin{bmatrix} x & x \\ x & x \end{bmatrix}$ and $0 < x < 1$, I is an identity matrix.

$\int (g(x) + 1)\sin x dx$ is equal to

- A. $\frac{1}{2\sqrt{e^x - 1}} - \operatorname{cosec}^{-1}(e^x) + c$
- 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 $\int R(x, \sqrt{ax^2 + bx + c}) dx$ are calculated 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 $ax^2 + bx + c = 0$

$\frac{x dx}{\sqrt{7x - 10 - x^2}}$ 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 $\int R(x, \sqrt{ax^2 + bx + c}) dx$ are calculated 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 $ax^2 + bx + c = 0$

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

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

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

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

D. none of these

Answer: B



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9. Euler's substitution:

Integrals of the form $\int R(x, \sqrt{ax^2 + bx + c}) dx$ are calculated 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 $ax^2 + bx + c = 0$

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

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

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

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

D. none of these

Answer: A



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

$f(x)$ is

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

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

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

D. none of these

Answer: B



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

- 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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$$\begin{aligned} \text{13. If } & \int \frac{x(x-1)}{(x^2+1)(x+1)\sqrt{x^3+x^2+x}} dx \\ &= \frac{1}{2} \log_e \left| \frac{\sqrt{f(x)} - 1}{\sqrt{f(x)} + 1} \right| - \tan^{-1} \sqrt{f(x)} + C, \text{ then} \end{aligned}$$

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

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

$$6 \int f(x)g(x)dx = x^6 + 3x^4 + 3x^2 + c \text{ and } 2 \int \frac{g(x)dx}{f(x)} = x^2 + c, \text{ where } f$$
$$\lim_{x \rightarrow 0} \frac{\log(f(x))}{g(x)} =$$

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 $\int \frac{x^4 + 1}{x(x^2 + 1)^2} dx = k \ln x + \frac{m}{1+x^2} + n$, 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
<p>a. If $f(x)$ is an integrable function for $x \in \left[\frac{\pi}{6}, \frac{\pi}{3}\right]$ and</p> $I_1 = \int_{\pi/6}^{\pi/3} \sec^2 \theta f(2\sin 2\theta) d\theta, \text{ and}$ $I_2 = \int_{\pi/6}^{\pi/3} \operatorname{cosec}^2 \theta f(2\sin 2\theta) d\theta, \text{ then } I_1/I_2 =$	p. 3
<p>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</p>	q. 1
<p>c. The value of</p> $2 \int_1^4 \frac{\tan^{-1}[x^2]}{\tan^{-1}[x^2] + \tan^{-1}[25+x^2-10x]} dx$ <p>(where $[.]$ denotes the greatest integer function) is</p>	r. 2
<p>d. If $I = \int_0^2 \sqrt{x + \sqrt{x + \sqrt{x + \dots}}} dx$</p> <p>(where $x > 0$), then $[I]$ is equal to (where $[.]$ denotes the greatest integer function)</p>	s. 4



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4. Consider

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

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 $f(x) = \int x^{\sin x} (1 + x \cos x \cdot \ln x + \sin x) dx$ and $f\left(\frac{\pi}{2}\right) = \frac{\pi^2}{4}$. The



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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 $k(x) = \int \frac{(x^2 + 1) dx}{\sqrt[3]{x^3 + 3x + 6}}$ and $k(-1) = \frac{1}{\sqrt[3]{2}}$. Then the value of k



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4. If the value $\int \frac{1 - (\cot x)^{2008}}{\tan x + (\cot x)^{2009}} dx = \frac{1}{k} \ln |\sin^k x + \cos^k x| + c$, 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 $\int f \circ g(x) dx = A f \circ g(x) + B \tan^{-1}(f \circ g(x)) + C$, 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 t



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8.

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



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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 $f(-1)$



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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 the va



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1. If $\int \frac{5 \tan x}{\tan x - 2} dx = x + a \ln(\sin x - 2 \cos x) + k$ then $a =$

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

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

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

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

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

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

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

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

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

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

- A. $\frac{-1}{1 + \cot^3 x} + C$
- B. $\frac{1}{3(1 + \tan^3 x)} + C$
- C. $\frac{-1}{3(1 + \tan^3 x)} + C$
- 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).
$$-\frac{1}{(\sec x + \tan x)^{\frac{11}{2}}} \left\{ \frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2 \right\} + K$$
$$\frac{1}{(\sec x + \tan x)^{\frac{1}{11}}} \left\{ \frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2 \right\} + K$$

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

- A. $-\frac{1}{(\sec x + \tan x)^{11/2}} \left\{ \frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2 \right\} + K$
- B. $\frac{1}{(\sec x + \tan x)^{1/11}} \left\{ \frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2 \right\} + K$
- 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. $\int \frac{\sec x \cdot \operatorname{cosec} x}{2 \cot x - \sec x \operatorname{cosec} x} dx$ is equal to

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

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

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

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

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

A. 3

B. 6

C. 9

D. 12

Answer: C



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

B is

A. $\frac{2}{9}$

B. $-\frac{1}{9}$

C. $\frac{1}{9}$

D. 0

Answer: D



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

A. 6

B. 7

C. 8

D. none of these

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: $\int \frac{x + x^{\frac{2}{3}} + x^{\frac{1}{6}}}{x(1 + x^{\frac{1}{3}})} dx$ 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. $\ln\left|\frac{1}{2}\sec(x^2 + 1)\right| + C$

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

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

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

Answer: B



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12. The value of $\int \frac{\operatorname{cosec} x}{\cos^2 \left(1 + \log \tan. \frac{x}{2}\right)} dx$ 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. $\sec. \frac{x^3}{4} + c$

B. $\frac{1}{12} \sec. \frac{x^3}{4} + c$

C. $\frac{1}{3} \sec. \frac{x^3}{4} + c$

D. none of these

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

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

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

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 constants.

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. $\int \frac{\sqrt{1-x^2}-x}{\sqrt{1-x^2}(1+x\sqrt{1-x^2})} dx$ 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 $I = \int x^{27} (6x^2 + 5x + 4) (x^2 + x + 1)^6 dx = f(x) + C$, then $f(x)$ is equal to

A. $\frac{x^4(1+x+x^2)^7}{7} + C$

B. $\frac{x^{28}(1+x+x^2)^7}{7} + C$

C. $\frac{x^{28}(1+x+x^2)^7}{28} + C$

D. None

Answer: B



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34. $\int \frac{x^2(1 - \log x)}{(\log x)^4 - x^4} dx$ equals

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

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. $\log_e \cdot \frac{1}{x^2+1} + c$
- 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. $\frac{1}{6} \log \cdot \frac{x^4 - x^2 + 1}{x(x^2 + 1)} + C$
- B. $\frac{1}{6} \tan^{-1} \cdot \frac{(x^2 + 1)^2}{2} + C$
- C. $\log \cdot \frac{x^4 - x^2 + 1}{(1 + x^2)^2} + C$
- D. $\tan^{-1} \cdot \frac{(x^2 + 1)^2}{2} + C$

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. $x - \log_e |x| + \log_e(x^2 + 1) - \tan^{-1} x + C$

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

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

D. none of these

Answer: B



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

A. $\frac{1}{2 \operatorname{cosec} x + \cot x} + C$

B. $2 \operatorname{cosec} x + \cot x + C$

C. $\frac{1}{2 \operatorname{cosec} x - \cot x} + C$

D. $2 \operatorname{cosec} x - \cot x + C$

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. $x f^{-1} + C$

C. $x f^{-1}(x) - g(f^{-1}(x)) + C$

D. $f^{-1}(x) + C$

Answer: C



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

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. $\int (\sin(101x) \cdot \sin^{99} x) dx$ 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 : $\int \sin 4x \cdot e^{\tan^2 x} dx$



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



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



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

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

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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