



MATHS

BOOKS - CENGAGE MATHS (HINGLISH)

INDEFINITE INTEGRATION

Examples

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

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

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

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

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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:

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



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17. Evaluate the following :

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



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



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



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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: $\int \{11 + 2x(\tan x + \sec x)\}^{\frac{1}{2}} dx$

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28. Evaluate $\int \tan x \tan 2x \tan 3x dx$.



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

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

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

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

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

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

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

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

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

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93. Evaluate $\int 2x^3 e^{x^2} dx$.



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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: $\int f(x) dx$ is polynomial function of the n th degree, prove that -

$$\int e^x f(x) dx = e^x [f(x) f'(x) + f''(x) + f'''(x) + \dots + (-1)^n f^{(n)}(x)]$$

Where

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



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



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



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



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



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

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



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



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



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



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

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

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

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

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

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

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



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121.

Evaluate:

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



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



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123. Evaluate $\int \frac{xdx}{x^3\sqrt{x^2-1}}$.



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

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

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

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

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128. Evaluate: for $m \in \mathbb{N}$, $\int x^{3m} + x^{2n} + x^m)(2x^{2m} + 3x^m + 6)^{\frac{1}{m}} dx, x > 0$

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

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130. $\int [\sin(101x) \cdot \sin^{99} x] dx$

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



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

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

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

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Exercise 7.2

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



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



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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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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) $\int \frac{\sin 2x}{\sin(x - \frac{\pi}{6})\sin(x + \frac{\pi}{6})} dx$

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

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

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

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

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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: $\int \frac{[\sqrt{1+x^2} + x]^n}{\sqrt{1+x^2}} dx$

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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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Exercise 7.6

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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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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Exercise 7.8

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

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

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

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

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

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

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

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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 $\int [f(x)g^n(x) - f^n(x)g(x)] dx$



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6. Evaluate: if $\int g(x) dx = g(x)$, then $\int g(x) \{f(x) + f'(x)\} dx$



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



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

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

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

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

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

Answer: D



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8.

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

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

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

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

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

A. $\frac{1}{2}(\cos x + \sin x - \frac{1}{\sqrt{2}} \log(\cos ecx - \cos x)) + C$

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

C. $\frac{1}{\sqrt{2}}(\sin x + \cos x + \frac{1}{2} \log|\cos ecx - \cos x|) + C$

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

Answer: D



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

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

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

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

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

Answer: D



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

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

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

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

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

D. non of these

Answer: B

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

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

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

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

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

Answer: C

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

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

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

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

D. non of these

Answer: A

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

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

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

Answer: C



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

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

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

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

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

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

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

D. non of these

Answer: C



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

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

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

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 $I^r(x)$ means $\log \log \log \dots x$ being repeated r times, then $\int [(xI(x))I^2(x)I^3(x)\dots I^r(x)]^{-1} dx$ is equal to :

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

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

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

D. non of these

Answer: A



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21. If $I = \int (\sqrt{\cot x} - \sqrt{\tan x}) dx$, then I equals

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

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

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

D. $\frac{1}{4}(\ln(\frac{x+1}{x-1}))$

Answer: C

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

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

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

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

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

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

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

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

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. none of these

Answer: B



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31. $\int \frac{\sec x dx}{\sqrt{\sin(2x + A) + \sin A}}$ is equal to

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. $\int \frac{\cos 2x}{(e^{-x} + \cos x)\sqrt{1 + \sin 2x}} dx, x \in (0, \frac{\pi}{2})$ 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. $\frac{1}{2} \ln|\cos 2x| - \frac{1}{4} \cos^2 2x + c$

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

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. non of these

Answer: C



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

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

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

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

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

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

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

Answer: B

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

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

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

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

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

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 $\frac{7}{11}(\tan \frac{\theta}{2})^{\frac{11}{7}} + C$ (b)

$\frac{7}{11}(\frac{\cos \theta}{2})^{\frac{11}{7}} + C$ $\frac{7}{11}(\sinh \frac{\eta}{2})^{\frac{11}{7}} + C$ (d) none of these

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

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

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

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

(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 to (a) $\frac{1}{3}$ (b) $\frac{2}{3}$
(c) $-\frac{1}{3}$ (d) $-\frac{2}{3}$

A. $1/3$

B. $2/3$

C. $-1/3$

D. $-2/3$

Answer: A



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47. The value of the integral $\int (x^2 + x)(x^{-8} + 2x^{-9})^{\frac{1}{10}} dx$ is
(a) $\frac{5}{11}(x^2 + 2x)^{\frac{11}{10}} + c$ (b) $\frac{5}{6}(x + 1x)^{\frac{11}{10}} + c$ (c) $\frac{6}{7}(x + 1)^{\frac{11}{10}} + c$ (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 $\frac{1}{3}\sqrt{1+x^2}(2+x^2) + C$ $\frac{1}{3}\sqrt{1+x^2}(x^2-1) + C$
 $\frac{1}{3}(1+x^2)^{3/2} + C$ (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. $x \tan^{-1} x - \ln \left| \sec(\tan^{-1} x) \right| + c$

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

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

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

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

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

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

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

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

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

D. none of these

Answer: A



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

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

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

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

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

Answer: A



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68. $\int e^{\tan x}(\sin x - \sec x)dx$ 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. $\int \frac{\cos e^{c^2 x} - 2005}{\cos^{2005} x} \cdot dx$

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

Answer: B

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

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

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

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

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

Answer: A



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

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 to

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

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

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

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

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)

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

A. constant

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

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

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

Answer: C



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Exercise (Multiple)

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

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. $\int \sqrt{1 + \cos x} dx$ equals $2 \sin^{-1} \sqrt{\sin x} + c$ (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 $\int \sec^2 x \cos^4 x dx = A \cot^3 x + B \tan x + C \cot x + D$, 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 $g(1) = \frac{3^7}{7}$ (b) $g(1) = \frac{2^7}{7}$ $g(-1) = \frac{1}{7}$ (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. $k = 2, f(x) = \tan^{-1} x, g(x) = \frac{\cot x}{\sqrt{\operatorname{cosec} x - 1}}$

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

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

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

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

$$A = -\frac{2}{3} \quad (b) \quad b = \left(\frac{4}{3}\right)e^3 \quad A = \frac{2}{3} \quad (d) \quad d \in \mathbb{R}$$

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

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

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

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

D. $d \in \mathbb{R}$

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 $f(x)$ is an even function $f(x)$ is a

bounded function the range of $f(x)$ is $(0, 1)$ $f(x)$ 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

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

then

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

Answer: C::D



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Exercise (Comprehension)

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. $(-\infty, 6]$

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 a square matrix and e^A is defined as

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

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

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

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

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

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 a square matrix and e^A is defined as

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

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

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



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 $ax^2 + bx + c = 0$

Which of the following functions does not appear in the primitive of

$$\frac{1}{1 + \sqrt{x^2 + 2x + 2}}$$
 if t is a function of x ?

A. $\log_e|t + 1|$

B. $\log_e|t + 2|$

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

D. none of these

Answer: D

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 $ax^2 + bx + c = 0$

Which of the following functions does not appear in the primitive of

$$\frac{dx}{x + \sqrt{x^2 - x + 1}}$$
 if t is a function of x ?

A. $\log_e |t|$

B. $\log_e |t - 2|$

C. $\log_e |t - 1|$

D. $\log_e |t + 1|$

Answer: B



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 $ax^2 + bx + c = 0$

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

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

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

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

D. none of these

Answer: A



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

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

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

A. $\pi/2$

B. $\pi/4$

C. π

D. 2π

Answer: A

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14. If a function satisfies the relation

$$f(x)f''(x) - f'(x)f'(x) = (f'(x))^2 \quad \forall x \in \mathbb{R} \text{ and } f(0) = f'(0) = 1, \text{ then}$$

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

$$f(x)f'(x) - f(x)f'(x) = (f'(x))^2 \quad \forall x \in \mathbb{R} \text{ and } f(0) = f'(0) = 1, \text{ then}$$

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

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

$\int (g(x) - f(x))dx$ 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

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

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

A. e

B. 2

C. 1

D. 0

Answer: D

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Exercise (Matrix)

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

<p>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</p>	<p>r. 3</p>
<p>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</p>	<p>s. 4</p>

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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 (which of the following functions appear in integration of functions in List I)
a. $\int \frac{x^2 - x + 1}{x^3 - 4x^2 + 4x} dx$	p. $\log x $
b. $\int \frac{x^2 - 1}{x(x-2)^3} dx$	q. $\log x-2 $
c. $\int \frac{x^3 + 1}{x(x-2)^2} dx$	r. $\frac{1}{(x-2)}$
d. $\int \frac{x^5 + 1}{x(x-2)^3} dx$	s. x



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4. Consider

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

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

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

Codes:

a b c d

(1) q p s r

(2) s p q r

(3) r q p s

(4) q s p r

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Exercise (Numerical)

1.

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

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

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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 $\int fog(x) dx = Afog(x) + B \tan^{-1}(fog(x)) + C$

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7.

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

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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 $f(1) \times f(-1)$

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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 $f(-1)$ is - .



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10.

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



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JEE Main Previous Year

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

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

Answer: C



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3. The integral $\int(1+x-\frac{1}{x})e^{x+\frac{1}{x}}dx$ 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. $(\frac{x^4+1}{x^4})^{1/4}+c$

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

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

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

Answer: D



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5. The integral $\int \frac{2x^{12} + 5x^9}{[x^5 + x^3 + 1]^3} \cdot dx$ 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. $(-\frac{1}{5}, 0)$

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

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

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

Answer: C



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

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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JEE Advanced Previous Year

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

K).

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

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

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

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

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

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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$$4. \int \frac{(\cos x)^{n-1}}{(\sin x)^{n+1}} dx = \text{(A) } -\frac{\cot^n x}{n} + c \text{ (B) } -\frac{\cot^n x}{n+1} + c \text{ (C) } \frac{\cot^n x}{n} + c \text{ (D) } \frac{\cot^n x}{n+1} + c$$

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

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

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

C. $\frac{3x^{\frac{2}{3}}}{10} + 6 \tan^{-1}(x^{\frac{1}{6}}) + C$

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

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 $x^2 \neq n\pi - 1, n \in \mathbb{N}$. 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. $\frac{1}{2} \ln \left| \sec(x^2 + 1) \right| + C$

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

Answer: B



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12. The value of $\int \frac{\operatorname{cosec} x}{\cos^2(1 + \log \tan. \frac{x}{2})} dx$ is

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

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

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

D. $\sin^2(1 + \log \tan. \frac{x}{2}) + c$

Answer: C



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

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

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. $\int x \cdot 2^{\ln(x^2+1)} dx$ 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 $\int \frac{\sin x}{\sin(x - \frac{\pi}{4})} dx = Af(x) + \frac{1}{\sqrt{2}} \log[|\sin x - \cos x|] + c$, 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. $\int \left(\sqrt{\frac{\cos x}{x}} - \sqrt{\frac{x}{\cos x}} \sin x \right) dx$ 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. $\int \frac{(2x + 1)}{(x^2 + 4x + 1)^{3/2}} dx$

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

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

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

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

Answer: B



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

A. 4

B. 5

C. 6

D. none

Answer: B



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

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

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

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

D. $\frac{\sqrt{\cot x} e^{\sqrt{\sin x}}}{2\sqrt{\cos x}} + C$

Answer: B



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21. $\int \frac{dx}{x\sqrt{x^6 + 1}}$ 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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$$22. \int \frac{dx}{(1 + \sqrt{x})^{2010}} = 2 \left[\frac{1}{\alpha(1 + \sqrt{x})^\alpha} - \frac{1}{(\beta(1 + \sqrt{x}))^\beta} \right] + c \quad \text{where}$$

$\alpha, \beta > 0$ then $\alpha - \beta$ is

A. 1

B. 2

C. -1

D. -2

Answer: A

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23. $\int \frac{\sin(\frac{\pi}{4} - x)dx}{2 + \sin 2x} = A \tan^{-1}(f(x)) + B$, 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 $\int \frac{dx}{\sqrt{x + \sqrt{x^2 + 2}}} = A \{x + \sqrt{x^2 + 2}\}^{3/2} + \frac{B}{\sqrt{x + \sqrt{x^2 + 2}}} + c$, then

the value of 3AB is

A. -1

B. -2

C. 1

D. 2

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.

If

$$\int \frac{3 \tan\left(x - \frac{\pi}{4}\right)}{\cos^2 x \sqrt{\tan^3 x + x \tan^2 x + \tan x}} = K \tan^{-1}(\sqrt{\tan x + 1 + \cot x}) + C,$$

then the value of K is

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

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

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

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

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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$$30. \int \frac{1}{(1 + \sqrt{x})\sqrt{x - x^2}} dx \text{ is equal to}$$

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

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

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. $\frac{1}{2} \ln \cdot \frac{x}{\ln x} - \frac{1}{4} \ln(\ln^2 x - x^2) + C$
- 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. $\int \frac{dx^3}{x^3(x^n+1)}$ 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. $\int \frac{(x+1)^2 x}{x(x^2+1)}$ is equal to

A. $\log_e x + c$

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

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

D. $\log_e \{x(x^2+1)\} + c$

Answer: B



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

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

B. $\frac{1}{6} \tan^{-1}. \frac{(x^2 + 1)^2}{2} + C$

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

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

Answer: A



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

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

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

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

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

B. $xf^{-1} + C$

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

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

Answer: C



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

A. $2e^{\cot x} \ln|\sin x| + c$

B. $2e^{\tan x} \ln|\sin x| + c$

C. $2e^{\cot x} \ln|\cos x| + c$

D. $2e^{\tan x} \ln|\cos x| + c$

Answer: A



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

A. $\sin x$

B. $\cos x$

C. $\tan x$

D. $\cot x$

Answer: C



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

A. $e(\frac{\pi}{4} - \frac{1}{2}) + 1$

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

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

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. $u = e^x + e^{-x}$

B. $u = e^x - e^{-x}$

$$C. t = e^x + e^{-x}$$

$$D. t = e^x - e^{-x}$$

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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1. Let $k(x) = \frac{(x^2 + 1)}{\sqrt{x^3 + 3x + 6}}$ and $k(-1) = \frac{1}{\sqrt{3(2)}}$ then the value of $k(-2)$ is

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2. If $f(x) = \int \frac{(1+x)(1-x+x^2)(1+x+x^2) + x^2}{1+2x+3x^2+4x^3+3x^4+2x^5+x^6} dx$ then find the value of $[F(99)-F(3)]$. [Note : $[k]$ denotes greatest integer less than or equal to k .]

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3. If $f(x) = \int 2e^x \cos^2 x (-\tan^2 x + \tan x + 1) dx$ and $f(x)$ passes through $(\pi, 0)$ then $(f(0) + f'(0))$ equals

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4.

If

$$\int \frac{\cos ec^2 x}{(\cos ecx + \cot x)^{\frac{9}{2}}} dx = (\cos ecx - \cot x)^{\frac{7}{2}} \left(\frac{1}{\alpha} + \frac{(\cos ecx - \cot x)^2}{11} \right) + C$$

where C is constant of integration and $\alpha \in \mathbb{N}$) then α is



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5. $\int \sin 4x e^{\tan^2 x} dx = c - A \cos^4 x \cdot e^{\tan^2 x}$ then A is equal to



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6. If $\int \frac{dx}{1 + \sqrt{x+1} + \sqrt{x}} = ax + b\sqrt{x} + c \int \sqrt{\frac{x+1}{x}} dx$ then $(a+b+c)$ equals



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7. $\int (4+x^{12})/((x^6-2x^3+2))dx = x^{\alpha}/\alpha + x^{\beta}/\gamma + \delta x + c$, then the * digit of the number $(\alpha - \beta + \gamma - \delta)^{99}$ is equal to (where 'c' in integration constant)

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8.

let

$$f(x) = \int \frac{4 + x^{12}}{x^4 + x^3 - 7x^2 - 4x + 16} dx = \frac{A}{\sqrt{3}} \tan^{-1} \left(\frac{Ax^2 + Bx + 2C}{\sqrt{3}x} \right)$$

such that $f(2) = \frac{\pi}{3\sqrt{3}}$ (A, B, C, in R), then value of $|A+B+C|$ is

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9. If curve $f(x) = \int x^1(2x^3 + 3x + 4)^3(1 + x + x^3)dx$ passes through origin & $f(1) = p/q$ where p & q are relatively prime then $p-q$ is

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10. If $f(x) = \frac{3(\ln x)^2 + (\ln x)^4}{x(1 + (\ln x)^2 - (\ln x)^3)^2} dx$ and $f(1) = 0$, then the value of

$|3f(e^2)|$ is equal to

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11. If $\frac{\sqrt{e^{7x}}}{\sqrt{e^{2x} + e^{-2x}}} dx = \frac{1}{k}(e^n + 1)^{\frac{\beta}{\gamma}} + C$ (where C is constant of integration and k, α, β, γ are positive integers and β, γ are relatively prime) then $(\frac{k}{\beta} + \frac{\gamma}{\alpha})$ is

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12. If

$$\int (\log_{e^x} e)(\log_{e^{2x}} e)(\log_{e^{3x}} e) \frac{dx}{x} = A \log|1 + \log x| + B \log|2 + \log x| + C \log|3 + \log x| + D$$

then $A+B+C$ is equal to

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13. Let $\int \cos^3 x dx = \sin x + \frac{\sin^3 x}{m} + \frac{\sin^5 x}{n} + c$, then $n+2m$ is equal to

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14. If $\frac{(\ln(\text{ex}^{x+1}) + (\ln x^{\sqrt{x}}))^2}{1 + (x \ln x)(\ln e^{2x^x})} dx = f(x) + C$, where $f(1) = 0$, then $e^{f(2)}$ is equal to

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15. If $\int (x^6 + 7x^5 + 6x^4 + 5x^3 + 4x^2 + 3x + 1)e^x dx$ is equal to $\sum_{k=1}^{\alpha} \beta x^k \cdot e^x + C$ (where C is constant of integration) then $(\alpha + \beta)$ is

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16. $\int \frac{(x^6 - 4)dx}{(x^6 + 2)^{1/4} x^4} = \frac{(x^6 + 2)^m}{x^n} + C$, then m/n is equal to

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17. Let $\int \frac{4 + 3x}{x^3 - 2x - 4} = \ln \left| \frac{x - k}{\sqrt{x^2 + kx + 1}} \right| + C$, then $k^2 + l^2$ is equal to



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18. If $\int \frac{x^8 - 12x^4 + 4}{x^4 - 4x^2 + 2} dx = \frac{x^a}{a} + \frac{4x^b}{b} + 2x + C$, then the value of $(a+b)$ is

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19. Suppose $A = \int \frac{dx}{x^2 + 6x + 25}$ and $B = \int \frac{dx}{x^2 - 6x - 27}$. If $12(A+B) = \lambda \tan^{-1}\left(\frac{x+3}{4}\right) + \mu \ln\left|\frac{x-9}{x+3}\right| + C$, then the value of $(\lambda + \mu)$ is

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20. Let $\int \frac{dx}{x^{2008} + x} = \frac{1}{p} \ln\left(\frac{x^q}{1+x^r}\right) + C$ where p, q, r in \mathbb{N} and need not be distinct, then the value of $(p+q+r)$ equals

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21. If $\int \frac{(2x + 3)dx}{x(x + 1)(x + 2)(x + 3) + 1} = C - \frac{1}{f(x)}$ where $f(x)$ is of the form of $ax^2 + bx + c$ then $(a+b+c)$ equals

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

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23. If $\int \frac{\ln\sqrt{x}}{x} dx = g(x) + C$ where $g(1) = 0$, then $g(e^6)$ is equal to

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24. $\int \frac{\sin^2(x)}{(\sec^2(x) - \cos^2(x))} dx = \lambda x - \frac{1}{\mu} \tan^{-1}((\tan x)/\sqrt{2}) + C$ where C is constant of integration, then $\lambda^2 + \mu^2$ is equal to

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25. If $\int e^x \left(\frac{x+2}{x+4} \right)^2 dx = e^x \left(\frac{x-\alpha}{x+\beta} \right) + C$ where C is integration constant),

then $|\beta - \alpha|$ is equal to

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