T1.30. Integrand involving hyperbolic functions, and their powers and products.

1. $\displaystyle\int \sinh\, ax\, dx = \frac{1}{a}\cosh\, ax.$

2. $\displaystyle\int \sinh^2\, ax\, dx = \frac{1}{4a}\sinh\, 2ax - \frac{x}{2}.$

3. $\displaystyle\int \sinh^3 x\, dx = -\frac{3}{4}\cosh\, x + \frac{1}{12}\cosh\, 3x = \frac{1}{3}\cosh^3\, x - \cosh\, x.$

4. $\displaystyle\int \sinh^4\, x\, dx = \frac{3}{8}x - \frac{1}{4}\sinh\, 2x + \frac{1}{32}\sinh\, 4x = \frac{3}{8}x - \frac{3}{8}\sinh\, x\cosh\, x + \frac{1}{4}\sinh^3\, x\cosh\, x.$

5. $\displaystyle\int \sinh^5\, x\, dx = \begin{cases} \dfrac{5}{8}\cosh\, x - \dfrac{5}{48}\cosh\, 3x + \dfrac{1}{80}\cosh\, 5x, \\ \quad \text{or} \\ \dfrac{4}{5}\cosh\, x + \dfrac{1}{5}\sinh^4\, x\cosh\, x - \dfrac{4}{15}\cosh^3\, x. \end{cases}$

6. $\displaystyle\int \sinh^6\, x\, dx = \begin{cases} -\dfrac{5}{16}x + \dfrac{15}{64}\sinh\, 2x - \dfrac{3}{64}\sinh\, 4x + \dfrac{1}{192}\sinh\, 6x, \\ \quad \text{or} \\ -\dfrac{5}{16}x + \dfrac{1}{6}\sinh^5\, x\cosh\, x - \dfrac{5}{24}\sinh^3\, x\cosh\, x + \dfrac{5}{16}\sinh\, x\cosh\, x. \end{cases}$

7. $\displaystyle\int \sinh^7\, x\, dx = \begin{cases} -\dfrac{35}{64}\cosh\, x + \dfrac{7}{64}\cosh\, 3x - \dfrac{7}{320}\cosh\, 5x + \dfrac{1}{448}\cosh\, 7x, \\ \quad \text{or} \\ = -\dfrac{24}{35}\cosh\, x + \dfrac{8}{35}\cosh^3 x - \dfrac{6}{35}\cosh\, x\sinh^4 x + \dfrac{1}{7}\cosh\, x\sinh^6\, x. \end{cases}$

8. $\displaystyle\int \cosh\, ax\, dx = \frac{1}{a}\sinh\, ax.$

9. $\displaystyle\int \cosh^2 ax\, dx = \frac{x}{2} + \frac{1}{4a}\sinh\, 2ax.$

10. $\displaystyle\int \cosh^3 x\, dx = \frac{3}{4}\sinh\, x + \frac{1}{12}\sinh\, 3x = \sinh\, x + \frac{1}{3}\sinh^3 x.$

11. $\displaystyle\int \cosh^4 x\, dx = \frac{3}{8}x + \frac{1}{4}\sinh\, 2x + \frac{1}{32}\sinh\, 4x = \frac{3}{8}x + \frac{3}{8}\sinh\, x\cosh\, x + \frac{1}{4}\sinh\, x\cosh^3 x.$

12. $\displaystyle\int \cosh^5 x\, dx = \begin{cases} \dfrac{5}{8}\sinh\, x + \dfrac{5}{48}\sinh\, 3x + \dfrac{1}{80}\sinh\, 5x, \\ \quad \text{or} \\ = \dfrac{4}{5}\sinh\, x + \dfrac{1}{5}\cosh^4 x\sinh\, x + \dfrac{4}{15}\sinh^3 x. \end{cases}$

13. $$\int \cosh^6 x\,dx = \begin{cases} \dfrac{5}{16}x + \dfrac{15}{64}\sinh 2x + \dfrac{3}{64}\sinh 4x + \dfrac{1}{192}\sinh 6x, \\ \quad\text{or} \\ = \dfrac{5}{16}x + \dfrac{5}{16}\sinh x\cosh x + \dfrac{5}{24}\sinh x\cosh^3 x + \dfrac{1}{6}\sinh x\cosh^5 x. \end{cases}$$

14. $$\int \cosh^7 x\,dx = \begin{cases} \dfrac{35}{64}\sinh x + \dfrac{7}{64}\sinh 3x + \dfrac{7}{320}\sinh 5x + \dfrac{1}{448}\sinh 7x, \\ \quad\text{or} \\ \dfrac{24}{35}\sinh x + \dfrac{8}{35}\sinh^3 x + \dfrac{6}{35}\sinh x\cosh^4 x + \dfrac{1}{7}\sinh x\cosh^6 x. \end{cases}$$

15. $$\int \sinh^{2m} x\,dx = (-1)^m \binom{2m}{m}\frac{x}{2^{2m}} + \frac{1}{2^{2m-1}}\sum_{k=0}^{m-1}(-1)^k\binom{2m}{k}\frac{\sinh(2m-2k)x}{2m-2k}.$$

16. $$\int \sinh^{2m+1} x\,dx = \begin{cases} \dfrac{1}{2^{2m}}\displaystyle\sum_{k=0}^{m}(-1)^k\binom{2m+1}{k}\frac{\cosh(2m-2k+1)x}{2m-2k+1}, \\ \quad\text{or} \\ = (-1)^n\displaystyle\sum_{k=0}^{m}(-1)^k\binom{m}{k}\frac{\cosh^{2k+1} x}{2k+1}. \end{cases}$$

17. $$\int \sinh^p x\cosh^{2n} x\,dx = \frac{\sinh^{p+1} x}{2n+p}\Bigg\{\cosh^{2n-1} x + \sum_{k=1}^{n-1}\frac{(2n-1)(2n-3)\dots(2n-2k+1)}{(2n+p-2)(2n+p-4)\dots(2n+p-2k)}\cosh^{2n-2k-1} x\Bigg\} + \frac{(2n-1)!!}{(2n+p)(2n+p-2)\dots(p+2)}\int \sinh^p x\,dx,$$

where p is real and $p \neq -2, -4, \dots, -2n$.

18. $$\int \sinh^p x\cosh^{2n+1} x\,dx = \frac{\sinh^{p+1} x}{2n+p+1}\left\{\cosh^{2n} x + \sum_{k=1}^{n}\frac{2^k n(n-1)\dots(n-k+1)\cosh^{2n-2k} x}{(2n+p-1)(2n+p-3)\dots(2n+p-2k+1)}\right\},$$

where p is real and $p \neq -1, -3, \dots, -(2n+1)$.

19. $$\int \cosh^{2m} x\,dx = \binom{2m}{m}\frac{x}{2^{2m}} + \frac{1}{2^{2m-1}}\sum_{k=0}^{m-1}\binom{2m}{k}\frac{\sinh(2m-2k)x}{2m-2k}.$$

20. $$\int \cosh^{2m+1} x\,dx = \begin{cases} \dfrac{1}{2^{2m}}\displaystyle\sum_{k=0}^{m}\binom{2m+1}{k}\frac{\sinh(2m-2k+1)x}{2m-2k+1}, \\ \quad\text{or} \\ \displaystyle\sum_{k=0}^{m}\binom{m}{k}\frac{\sinh^{2k+1} x}{2k+1}. \end{cases}$$

21. $$\int \cosh^p x \sinh^{2n} x\,dx = \frac{\cosh^{p+1} x}{2n+p}\Bigg\{\sinh^{2n-1} x + \sum_{k=1}^{n-1}(-1)^k \frac{(2n-1)(2n-3)\dots(2n-2k+1)\sinh^{2n-2k-1} x}{(2n+p-2)(2n+p-4)\dots(2n+p-2k)}\Bigg\} + (-1)^n \frac{(2n-1)!!}{(2n+p)(2n+p-2)\dots(p+2)}\int \cosh^p x\,dx,$$

where p is real and $p \neq -2, -4, \dots, -2n$.

22. $$\int \cosh^p x \sinh^{2n+1} x\,dx = \frac{\cosh^{p+1} x}{2n+p+1}\Bigg\{\sinh^{2n} x + \sum_{k=1}^{n}(-1)^k \frac{2^k n(n-1)\dots(n-k+1)\sinh^{2n-2k} x}{(2n+p-1)(2n+p-3)\dots(2n+p-2k+1)}\Bigg\},$$

where p is real and $p \neq -1, -3, \dots, -(2n+1)$.

23. $$\int \sinh^p x \cosh^q x\,dx = \begin{cases} \dfrac{\sinh^{p+1} x \cosh^{q-1} x}{p+q} + \dfrac{q-1}{p+q}\displaystyle\int \sinh^p x \cosh^{q-2} x\,dx, \\ \quad\text{or} \\ \dfrac{\sinh^{p-1} x \cosh^{q+1} x}{p+q} - \dfrac{p-1}{p+q}\displaystyle\int \sinh^{p-2} x \cosh^{q} x\,dx, \\ \quad\text{or} \\ \dfrac{\sinh^{p-1} x \cosh^{q+1} x}{q+1} - \dfrac{p-1}{q+1}\displaystyle\int \sinh^{p-2} x \cosh^{q+2} x\,dx, \\ \dfrac{\sinh^{p+1} x \cosh^{q-1} x}{p+1} - \dfrac{q-1}{p+1}\displaystyle\int \sinh^{p+2} x \cosh^{q-2} x\,dx, \\ \quad\text{or} \\ \dfrac{\sinh^{p+1} x \cosh^{q+1} x}{p+1} - \dfrac{p+q+2}{p+1}\displaystyle\int \sinh^{p+2} x \cosh^{q} x\,dx, \\ \quad\text{or} \\ -\dfrac{\sinh^{p+1} x \cosh^{q+1} x}{q+1} + \dfrac{p+q+2}{q+1}\displaystyle\int \sinh^{p} x \cosh^{q+2} x\,dx. \end{cases}$$

24. $$\int \sinh ax \cosh bx\,dx = \frac{\cosh(a+b)x}{2(a+b)} + \frac{\cosh(a-b)x}{2(a-b)}.$$

25. $$\int \sinh ax \cosh ax\,dx = \frac{1}{4a}\cosh 2ax.$$

26. $$\int \sinh^2 x \cosh x\,dx = \frac{1}{3}\sinh^3 x.$$

27. $$\int \sinh^3 x \cosh x\,dx = \frac{1}{4}\sinh^4 x.$$

28. $$\int \sinh^4 x \cosh x\,dx = \frac{1}{5}\sinh^5 x.$$

29. $\displaystyle\int \sinh x \cosh^2 x\,dx = \frac{1}{3}\cosh^3 x.$

30. $\displaystyle\int \sinh^2 x \cosh^2 x\,dx = -\frac{x}{8} + \frac{1}{32}\sinh 4x.$

31. $\displaystyle\int \sinh^3 x \cosh^2 x\,dx = \frac{1}{5}\left(\sinh^2 x - \frac{2}{3}\right)\cosh^3 x.$

32. $\displaystyle\int \sinh^4 x \cosh^2 x\,dx = \frac{x}{16} - \frac{1}{64}\sinh 2x - \frac{1}{64}\sinh 4x + \frac{1}{192}\sinh 6x.$

33. $\displaystyle\int \sinh x \cosh^3 x\,dx = \frac{1}{4}\cosh^4 x.$

34. $\displaystyle\int \sinh^2 x \cosh^3 x\,dx = \frac{1}{5}\left(\cosh^2 x + \frac{2}{3}\right)\sinh^3 x.$

35. $$\int \sinh^3 x \cosh^3 x\,dx = \begin{cases} -\dfrac{3}{64}\cosh 2x + \dfrac{1}{192}\cosh 6x = \dfrac{1}{48}\cosh^3 2x - \dfrac{1}{16}\cosh 2x, \\ \quad\text{or} \\ \dfrac{\sinh^6 x}{6} + \dfrac{\sinh^4 x}{4}, \\ \quad\text{or} \\ \dfrac{\cosh^6 x}{6} - \dfrac{\cosh^4 x}{4}. \end{cases}$$

36. $$\int \sinh^4 x \cosh^3 x\,dx = \begin{cases} \dfrac{1}{7}\sinh^3 x\left(\cosh^4 x - \dfrac{3}{5}\cosh^2 x - \dfrac{2}{5}\right), \\ \quad\text{or} \\ \dfrac{1}{7}\left(\cosh^2 x + \dfrac{2}{5}\right)\sinh^5 x. \end{cases}$$

37. $\displaystyle\int \sinh x \cosh^4 x\,dx = \frac{1}{5}\cosh^5 x.$

38. $\displaystyle\int \sinh^2 x \cosh^4 x\,dx = -\frac{x}{16} - \frac{1}{64}\sinh 2x + \frac{1}{64}\sinh 4x + \frac{1}{192}\sinh 6x.$

39. $$\int \sinh^3 x \cosh^4 x\,dx = \begin{cases} \dfrac{1}{7}\cosh^3 x\left(\sinh^4 x + \dfrac{3}{5}\sinh^2 x - \dfrac{2}{5}\right), \\ \quad\text{or} \\ \dfrac{1}{7}\left(\sinh^2 x - \dfrac{2}{5}\right)\cosh^5 x. \end{cases}$$

40. $\displaystyle\int \sinh^4 x \cosh^4 x\,dx = \frac{3x}{128} - \frac{1}{128}\sinh 4x + \frac{1}{1024}\sinh 8x.$

41. $\displaystyle\int \frac{dx}{\sinh x} = \ln \tanh \frac{x}{2} = \frac{1}{2} \ln \frac{\cosh x - 1}{\cosh x + 1}.$

42. $\displaystyle\int \frac{dx}{\sinh^2 x} = -\coth x.$

43. $\displaystyle\int \frac{dx}{\sinh^3 x} = -\frac{\cosh x}{2 \sinh^2 x} - \frac{1}{2} \ln \tanh \frac{x}{2}.$

44. $\displaystyle\int \frac{dx}{\sinh^4 x} = -\frac{\cosh x}{3 \sinh^3 x} + \frac{2}{3} \coth x = -\frac{1}{3} \coth^3 x + \coth x.$

45. $\displaystyle\int \frac{dx}{\sinh^5 x} = -\frac{\cosh x}{4 \sinh^4 x} + \frac{3}{8} \frac{\cosh x}{\sinh^2 x} + \frac{3}{8} \ln \tanh \frac{x}{2}.$

46. $\displaystyle\int \frac{dx}{\sinh^6 x} = -\frac{\cosh x}{5 \sinh^5 x} + \frac{4}{15} \coth^3 x - \frac{4}{5} \coth x = -\frac{1}{5} \coth^5 x + \frac{2}{3} \coth^3 x - \coth x.$

47. $\displaystyle\int \frac{dx}{\sinh^7 x} = -\frac{\cosh x}{6 \sinh^2 x} \left(\frac{1}{\sinh^4 x} - \frac{5}{4 \sinh^2 x} + \frac{15}{8} \right) - \frac{5}{16} \ln \tanh \frac{x}{2}.$

48. $\displaystyle\int \frac{dx}{\sinh^8 x} = \coth x - \coth^3 x + \frac{3}{5} \coth^5 x - \frac{1}{7} \coth^7 x.$

49. $\displaystyle\int \frac{dx}{\cosh x} = \arctan(\sinh x) = 2 \arctan(e^x) = \arcsin(\tanh x).$

50. $\displaystyle\int \frac{dx}{\cosh^2 x} = \tanh x.$

51. $\displaystyle\int \frac{dx}{\cosh^3 x} = \frac{\sinh x}{2 \cosh^2 x} + \frac{1}{2} \arctan(\sinh x).$

52. $\displaystyle\int \frac{dx}{\cosh^4 x} = \frac{\sinh x}{3 \cosh^3 x} + \frac{2}{3} \tanh x = -\frac{1}{3} \tanh^3 x + \tanh x.$

53. $\displaystyle\int \frac{dx}{\cosh^5 x} = \frac{\sinh x}{4 \cosh^4 x} + \frac{3}{8} \frac{\sinh x}{\cosh^2 x} + \frac{3}{8} \arctan(\sinh x).$

54. $\displaystyle\int \frac{dx}{\cosh^6 x} = \frac{\sinh x}{5 \cosh^5 x} - \frac{4}{15} \tanh^3 x + \frac{4}{5} \tanh x = \frac{1}{5} \tanh^5 x - \frac{2}{3} \tanh^3 x + \tanh x.$

55. $\displaystyle\int \frac{dx}{\cosh^7 x} = \frac{\sinh x}{6 \cosh^2 x} \left(\frac{1}{\cosh^4 x} + \frac{5}{4 \cosh^2 x} + \frac{15}{8} \right) + \frac{5}{16} \arctan(\sinh x).$

56. $\displaystyle\int \frac{dx}{\cosh^8 x} = -\frac{1}{7} \tanh^7 x + \frac{3}{5} \tanh^5 x - \tanh^3 x + \tanh x.$

57. $\displaystyle\int \frac{\sinh x}{\cosh x}\, dx = \ln \cosh x.$

58. $\displaystyle\int \frac{\sinh^2 x}{\cosh x}\, dx = \sinh x - \arctan(\sinh x).$

59. $\displaystyle\int \frac{\sinh^3 x}{\cosh x}\, dx = \frac{1}{2} \sinh^2 x - \ln \cosh x = \frac{1}{2} \cosh^2 x - \ln \cosh x.$

60. $\displaystyle\int \frac{\sinh^4 x}{\cosh x}\,dx = \frac{1}{3}\sinh^3 x - \sinh x + \arctan(\sinh x).$

61. $\displaystyle\int \frac{\sinh x}{\cosh^2 x}\,dx = -\frac{1}{\cosh x}.$

62. $\displaystyle\int \frac{\sinh^2 x}{\cosh^2 x}\,dx = x - \tanh x.$

63. $\displaystyle\int \frac{\sinh^3 x}{\cosh^2 x}\,dx = \cosh x + \frac{1}{\cosh x}.$

64. $\displaystyle\int \frac{\sinh^4 x}{\cosh^2 x}\,dx = -\frac{3}{2}x + \frac{1}{4}\sinh 2x + \tanh x.$

65. $\displaystyle\int \frac{\sinh x}{\cosh^3 x}\,dx = -\frac{1}{2\cosh^2 x} = \frac{1}{2}\tanh^2 x.$

66. $\displaystyle\int \frac{\sinh^2 x}{\cosh^3 x}\,dx = -\frac{\sinh x}{2\cosh^2 x} + \frac{1}{2}\arctan(\sinh x).$

67. $\displaystyle\int \frac{\sinh^3 x}{\cosh^3 x}\,dx = -\frac{1}{2}\tanh^2 x + \ln\cosh x = \frac{1}{2\cosh^2 x} + \ln\cosh x.$

68. $\displaystyle\int \frac{\sinh^4 x}{\cosh^3 x}\,dx = \frac{\sinh x}{2\cosh x} + \sinh x - \frac{3}{2}\arctan(\sinh x).$

69. $\displaystyle\int \frac{\sinh x}{\cosh^4 x}\,dx = -\frac{1}{3\cosh^3 x}.$

70. $\displaystyle\int \frac{\sinh^2 x}{\cosh^4 x}\,dx = \frac{1}{3}\tanh^3 x.$

71. $\displaystyle\int \frac{\sinh^3 x}{\cosh^4 x}\,dx = -\frac{1}{\cosh x} + \frac{1}{3\cosh^3 x}.$

72. $\displaystyle\int \frac{\sinh^4 x}{\cosh^4 x}\,dx = -\frac{1}{3}\tanh^3 x - \tanh x + x.$

73. $\displaystyle\int \frac{\cosh x}{\sinh x}\,dx = \ln\sinh x.$

74. $\displaystyle\int \frac{\cosh^2 x}{\sinh x}\,dx = \cosh x + \ln\tanh\frac{x}{2}.$

75. $\displaystyle\int \frac{\cosh^3 x}{\sinh x}\,dx = \frac{1}{2}\cosh^2 x + \ln\sinh x.$

76. $\displaystyle\int \frac{\cosh^4 x}{\sinh x}\,dx = \frac{1}{3}\cosh^3 x + \cosh x + \ln\tanh\frac{x}{2}.$

77. $\displaystyle\int \frac{\cosh x}{\sinh^2 x}\,dx = -\frac{1}{\sinh x}.$

78. $\displaystyle\int \frac{\cosh^2 x}{\sinh^2 x}\,dx = x - \coth x.$

79. $\displaystyle\int \frac{\cosh^3 x}{\sinh^2 x}\,dx = \sinh x - \frac{1}{\sinh x}.$

80. $\displaystyle\int \frac{\cosh^4 x}{\sinh^2 x}\,dx = \frac{3}{2}x + \frac{1}{4}\sinh 2x - \coth x.$

81. $\displaystyle\int \frac{\cosh x}{\sinh^3 x}\,dx = -\frac{1}{2\sinh^2 x} = -\frac{1}{2}\coth^2 x.$

82. $\displaystyle\int \frac{\cosh^2 x}{\sinh^3 x}\,dx = -\frac{\cosh x}{2\sinh^2 x} + \ln\tanh\frac{x}{2}.$

83. $\displaystyle\int \frac{\cosh^3 x}{\sinh^3 x}\,dx = -\frac{1}{2\sinh^2 x} + \ln\sinh x = -\frac{1}{2}\coth^2 x + \ln\sinh x.$

84. $\displaystyle\int \frac{\cosh^4 x}{\sinh^3 x}\,dx = -\frac{\cosh x}{2\sinh^2 x} + \cosh x + \frac{3}{2}\ln\tanh\frac{x}{2}.$

85. $\displaystyle\int \frac{\cosh x}{\sinh^4 x}\,dx = -\frac{1}{3\sinh^3 x}.$

86. $\displaystyle\int \frac{\cosh^2 x}{\sinh^4 x}\,dx = -\frac{1}{3}\coth^3 x.$

87. $\displaystyle\int \frac{\cosh^3 x}{\sinh^4 x}\,dx = -\frac{1}{\sinh x} - \frac{1}{3\sinh^3 x}.$

88. $\displaystyle\int \frac{\cosh^4 x}{\sinh^4 x}\,dx = -\frac{1}{3}\coth^3 x - \coth x + x.$

89. $\displaystyle\int \frac{dx}{\sinh x\cosh x} = \ln\tanh x.$

90. $\displaystyle\int \frac{dx}{\sinh x\cosh^2 x} = \frac{1}{\cosh x} + \ln\tanh\frac{x}{2}.$

91. $\displaystyle\int \frac{dx}{\sinh x\cosh^3 x} = \frac{1}{2\cosh^2 x} + \ln\tanh x = -\frac{1}{2}\tanh^2 x + \ln\tanh x.$

92. $\displaystyle\int \frac{dx}{\sinh x\cosh^4 x} = \frac{1}{\cosh x} + \frac{1}{3\cosh^3 x} + \ln\tanh\frac{x}{2}.$

93. $\displaystyle\int \frac{dx}{\sinh^2 x\cosh x} = -\frac{1}{\sinh x} - \arctan(\sinh x).$

94. $\displaystyle\int \frac{dx}{\sinh^2 x\cosh^2 x} = -2\coth 2x.$

95. $\displaystyle\int \frac{dx}{\sinh^2 x\cosh^3 x} = -\frac{\sinh x}{2\cosh^2 x} - \frac{1}{\sinh x} - \frac{3}{2}\arctan(\sinh x).$

96. $\displaystyle\int \frac{dx}{\sinh^2 x \cosh^4 x} = \frac{1}{3 \sinh x \cosh^3 x} - \frac{8}{3} \coth 2x.$

97. $\displaystyle\int \frac{dx}{\sinh^3 x \cosh x} = -\frac{1}{2 \sinh^2 x} - \ln \tanh x = -\frac{1}{2} \coth^2 x + \ln \coth x.$

98. $\displaystyle\int \frac{dx}{\sinh^3 x \cosh^2 x} = -\frac{1}{\cosh x} - \frac{\cosh x}{2 \sinh^2 x} - \frac{3}{2} \ln \tanh \frac{x}{2}.$

99. $\displaystyle\int \frac{dx}{\sinh^3 x \cosh^3 x} = -\frac{2 \cosh 2x}{\sinh^2 2x} - 2 \ln \tanh x = \frac{1}{2} \tanh^2 x - \frac{1}{2} \coth^2 x - 2 \ln \tanh x.$

100. $\displaystyle\int \frac{dx}{\sinh^3 x \cosh^4 x} = -\frac{2}{\cosh x} - \frac{1}{3 \cosh^2 x} - \frac{\cosh x}{2 \sinh^2 x} - \frac{5}{2} \ln \tanh \frac{x}{2}.$

101. $\displaystyle\int \frac{dx}{\sinh^4 x \cosh x} = \frac{1}{\sinh x} - \frac{1}{3 \sinh^3 x} + \arctan \sinh x.$

102. $\displaystyle\int \frac{dx}{\sinh^4 x \cosh^2 x} = -\frac{1}{3 \cosh x \sinh^3 x} + \frac{8}{3} \coth 2x.$

103. $\displaystyle\int \frac{dx}{\sinh^4 x \cosh^3 x} = \frac{2}{\sinh x} - \frac{1}{3 \sinh^3 x} + \frac{\sinh x}{2 \cosh^2 x} + \frac{5}{2} \arctan(\sinh x).$

104. $\displaystyle\int \frac{dx}{\sinh^4 x \cosh^4 x} = 8 \coth 2x - \frac{8}{3} \coth^3 2x.$

105. $\displaystyle\int \frac{\sinh(2n+1)x}{\sinh x}\, dx = 2\sum_{k=0}^{n-1} \frac{\sinh(2n-2k)x}{2n-2k} + x.$

106. $\displaystyle\int \frac{\sinh 2nx}{\sinh x}\, dx = 2\sum_{k=0}^{n-1} \frac{\sinh(2n-2k-1)x}{2n-2k-1}.$

107. $\displaystyle\int \frac{\cosh(2n+1)x}{\sinh x}\, dx = 2\sum_{k=0}^{n-1} \frac{\cosh(2n-2k)x}{2n-2k} + \ln \sinh x.$

108. $\displaystyle\int \frac{\cosh 2nx}{\sinh x}\, dx = 2\sum_{k=0}^{n-1} \frac{\cosh(2n-2k-1)x}{2n-2k-1} + \ln \tanh \frac{x}{2}.$

109. $\displaystyle\int \frac{\sinh(2n+1)x}{\cosh x}\, dx = 2\sum_{k=0}^{n-1} (-1)^k \frac{\cosh(2n-2k)x}{2n-2k} + (-1)^n \ln \cosh x.$

110. $\displaystyle\int \frac{\sinh 2nx}{\cosh x}\, dx = 2\sum_{k=0}^{n-1} (-1)^k \frac{\cosh(2n-2k-1)x}{2n-2k-1}.$

111. $\displaystyle\int \frac{\cosh(2n+1)x}{\cosh x}\, dx = 2\sum_{k=0}^{n-1} (-1)^k \frac{\sinh(2n-2k)x}{2n-2k} + (-1)^n x.$

112. $\displaystyle\int \frac{\cosh\, 2nx}{\cosh\, x}\, dx = 2\sum_{k=0}^{n-1}(-1)^k \frac{\sinh(2n-2k-1)x}{2n-2k-1} + (-1)^n \arcsin(\tanh\, x).$

113. $\displaystyle\int \frac{\sinh\, 2x}{\sinh^n x}\, dx = -\frac{2}{(n-2)\sinh^{n-2} x}.$

114. $\displaystyle\int \frac{\sinh\, 2x}{\sinh^2 x}\, dx = 2\ \ln\ \sinh\ x.$

115. $\displaystyle\int \frac{\sinh\, 2x\, dx}{\cosh^n x} = \frac{2}{(2-n)\ \cosh^{n-2} x}.$

116. $\displaystyle\int \frac{\sinh\, 2x}{\cosh^2 x}\, dx = 2\ \ln\ \cosh\ x.$

117. $\displaystyle\int \frac{\cosh\, 2x}{\sinh\, x}\, dx = 2\ \cosh\ x + \ln\ \tanh\ \frac{x}{2}.$

118. $\displaystyle\int \frac{\cosh\, 2x}{\sinh^2 x}\, dx = -\coth\ x + 2x.$

119. $\displaystyle\int \frac{\cosh\, 2x}{\sinh^3 x}\, dx = -\frac{\cosh\ x}{2\ \sinh^2 x} + \frac{3}{2}\ln\ \tanh\ \frac{x}{2}.$

120. $\displaystyle\int \frac{\cosh\, 2x}{\cosh\, x}\, dx = 2\ \sinh\ x - \arcsin\,(\tanh\ x).$

121. $\displaystyle\int \frac{\cosh\, 2x}{\cosh^2 x}\, dx = -\tanh\ x + 2x.$

122. $\displaystyle\int \frac{\cosh\, 2x}{\cosh^3 x}\, dx = -\frac{\sinh\ x}{2\ \cosh^2 x} + \frac{3}{2}\arcsin(\tanh\ x).$

123. $\displaystyle\int \frac{\sinh\, 3x}{\sinh\, x}\, dx = x + \sinh\ 2x.$

124. $\displaystyle\int \frac{\sinh\, 3x}{\sinh^2 x}\, dx = 3\ \ln\ \tanh\ \frac{x}{2} + 4\ \cosh\ x.$

125. $\displaystyle\int \frac{\sinh\, 3x}{\sinh^3 x}\, dx = -3\ \coth\ x + 4x.$

126. $\displaystyle\int \frac{\sinh\, 3x}{\cosh^n x}\, dx = \frac{4}{(3-n)\cosh^{n-3} x} - \frac{1}{(1-n)\cosh^{n-1} x}.$

127. $\displaystyle\int \frac{\sinh\, 3x}{\cosh\, x}\, dx = 2\ \sinh^2 x - \ln\ \cosh\ x.$

128. $\displaystyle\int \frac{\sinh\, 3x}{\cosh^3 x}\, dx = \frac{1}{2\ \cosh^2 x} + 4\ln\ \cosh x.$

129. $\displaystyle\int \frac{\cosh\, 3x}{\sinh^n x}\, dx = \frac{4}{(3-n)\ \sinh^{n-3} x} + \frac{1}{(1-n)\ \sinh^{n-1} x}.$

130. $\displaystyle\int \frac{\cosh\, 3x}{\sinh\, x}\,dx = 2\,\sinh^2 x + \ln \sinh\, x.$

131. $\displaystyle\int \frac{\cosh\, 3x}{\sinh^3 x}\,dx = -\frac{1}{2\,\sinh^2 x} + 4\ln \sinh\, x.$

132. $\displaystyle\int \frac{\cosh\, 3x}{\cosh\, x}\,dx = \sinh\, 2x - x.$

133. $\displaystyle\int \frac{\cosh\, 3x}{\cosh^2 x}\,dx = 4\,\sinh\, x - 3\,\arcsin(\tanh\, x).$

134. $\displaystyle\int \frac{\cosh\, 3x}{\cosh^3 x}\,dx = 4x - 3\,\tanh\, x.$

135. $$\int \frac{dx}{\sinh^{2m} x} = \frac{\cosh\, x}{2m-1}\Bigg\{-\operatorname{csch}^{2m-1} x + \sum_{k=1}^{m-1} (-1)^{k-1}\frac{2^k(m-1)(m-2)\dots(m-k)}{(2m-3)(2m-5)\dots(2m-2k-1)}\,\operatorname{csch}^{2m-2k-1} x\Bigg\}.$$

136. $$\int \frac{dx}{\sinh^{2m+1} x} = \frac{\cosh\, x}{2m}\Bigg\{-\operatorname{csch}^{2m} x + \sum_{k=1}^{m-1} (-1)^{k-1}\frac{(2m-1)(2m-3)\dots(2m-2k+1)}{2^k(m-1)(m-2)\dots(m-k)}\,\operatorname{csch}^{2m-2k} x\Bigg\} + (-1)^m\frac{(2m-1)!!}{(2m)!!}\ln\tanh\frac{x}{2}.$$

137. $$\int \frac{\sinh^p x}{\cosh^{2n} x}\,dx = \frac{\sinh^{p+1}}{2n-1}\Bigg\{\operatorname{sech}^{2n-1} x + \sum_{k=1}^{n-1}\frac{(2n-p-2)(2n-p-4)\dots(2n-p-2k)}{(2n-3)(2n-5)\dots(2n-2k-1)}\,\operatorname{sech}^{2n-2k-1} x\Bigg\} + \frac{(2n-p-2)(2n-p-4)\dots(-p+2)(-p)}{(2n-1)!!}\int \sinh^p x\,dx, \quad p \text{ real}.$$

138. $$\int \frac{\sinh^p x}{\cosh^{2n+1} x}\,dx = \frac{\sinh^{p+1} x}{2n}\Bigg\{\operatorname{sech}^{2n} x + \sum_{k=1}^{n-1}\frac{(2n-p-1)(2n-p-3)\dots(2n-p-2k+1)}{2^k(n-1)(n-2)\dots(n-k)}\operatorname{sech}^{2n-2k} x\Bigg\} + \frac{(2n-p-1)(2n-p-3)\dots(3-p)(1-p)}{2^n n!}\int \frac{\sinh^p x}{\cosh\, x}\,dx, \quad p \text{ real}.$$

139. $$\int \frac{\sinh^{2m+1} x}{\cosh x}\, dx = \begin{cases} \displaystyle\sum_{k=1}^{m} \frac{(-1)^{m+k}}{2k} \sinh^{2k} x + (-1)^m \ln \cosh x, \\ \quad \text{or} \\ \displaystyle = \sum_{k=1}^{m} \frac{(-1)^{m+k}}{2k} \binom{m}{k} \cosh^{2k} x + (-1)^m \ln \cosh x, \quad m \ge 1. \end{cases}$$

140. $$\int \frac{\sinh^{2m} x}{\cosh x}\, dx = \sum_{k=1}^{m} \frac{(-1)^{m+k}}{2k-1} \sinh^{2k-1} x + (-1)^m \arctan(\sinh x), \quad m \ge 1.$$

141. $$\int \frac{dx}{\sinh^{2m+1} x \cosh x} = \sum_{k=1}^{m} \frac{(-1)^k \operatorname{csch}^{2m-2k+2} x}{2m-2k+2} + (-1)^m \ln \tanh x.$$

142. $$\int \frac{dx}{\sinh^{2m} x \cosh x} = \sum_{k=1}^{m} \frac{(-1)^k \operatorname{csch}^{2m-2k+2} x}{2m-2k+1} + (-1)^m \arctan \sinh x.$$

143. $$\int \frac{dx}{\cosh^{2m} x} = \frac{\sinh x}{2m-1} \left\{ \operatorname{sech}^{2m-1} x + \sum_{k=1}^{m-1} \frac{2^k (m-1)(m-2)\dots(m-k)}{(2m-3)(2m-5)\dots(2m-2k-1)} \operatorname{sech}^{2m-2k-1} x \right\}.$$

144. $$\int \frac{dx}{\cosh^{2m+1} x} = \frac{\sinh x}{2m} \left\{ \operatorname{sech}^{2m} x + \sum_{k=1}^{m-1} \frac{(2m-1)(2m-3)\dots(2m-2k+1)}{2^k (m-1)(m-2)\dots(m-k)} \operatorname{sech}^{2m-2k} x \right\} + \frac{(2m-1)!!}{(2m)!!} \arctan(\sinh x).$$

145. $$\int \frac{\cosh^p x}{\sinh^{2n+1} x}\, dx = -\frac{\cosh^{p+1} x}{2n} \left\{ \operatorname{csch}^{2n} x + \sum_{k=1}^{n-1} \frac{(-1)^k (2n-p-1)(2n-p-3)\dots(2n-p-2k+1)}{2^k (n-1)(n-2)\dots(n-k)} \operatorname{csch}^{2n-2k} x \right\} + \frac{(-1)^n (2n-p-1)(2n-p-3)\dots(3-p)(1-p)}{2^n n!} \int \frac{\cosh^p x}{\sinh x}\, dx, \quad p \text{ real}.$$

146. $$\int \frac{\cosh^{2m} x}{\sinh x}\, dx = \sum_{k=1}^{m} \frac{\cosh^{2k-1} x}{2k-1} + \ln \tanh \frac{x}{2}.$$

147. $$\int \frac{\cosh^{2m+1} x}{\sinh x}\, dx = \sum_{k=1}^{m} \frac{\cosh^{2k} x}{2k} + \ln \sinh x = \sum_{k=1}^{m} \binom{m}{k} \frac{\sinh^{2k} x}{2k} + \ln \sinh x.$$

148. $$\int \frac{\cosh^p x}{\sinh^{2n} x}\,dx = -\frac{\cosh^{p+1} x}{2n-1}\Bigg\{\operatorname{csch}^{2n-1} x + \sum_{k=1}^{n-1} \frac{(-1)^k (2n-p-2)(2n-p-4)\ldots(2n-p-2k)}{(2n-3)(2n-5)\ldots(2n-2k-1)}\ \operatorname{csch}^{2n-2k-1} x\Bigg\} + \frac{(-1)^n (2n-p-2)(2n-p-4)\ldots(-p+2)(-p)}{(2n-1)!!}\int \cosh^p x\,dx, \quad p \text{ real}.$$

149. $$\int \frac{dx}{\sinh x \cosh^{2m} x} = \sum_{k=1}^{m} \frac{\operatorname{sech}^{2m-2k+1} x}{2m-2k+1} + \ln \tanh \frac{x}{2}.$$

150. $$\int \frac{dx}{\sinh x \cosh^{2m+1} x} = \sum_{k=1}^{m} \frac{\operatorname{sech}^{2m-2k+2} x}{2m-2k+2} + \ln \tanh x.$$

151. $$\int \frac{\sinh^{2n+1} x}{\cosh^m x}\,dx = \sum_{\substack{k=0\\ k\neq (m-1)/2}}^{n} (-1)^{n+k}\binom{n}{k}\frac{\cosh^{2k-m+1} x}{2k-1+1} + s(-1)^{n+(m-1)/2}\binom{n}{(m-1)/2}\ln \cosh x,$$

where $s = 1$ for m odd and $m < 2n+1$, and $s = 0$ otherwise.

152. $$\int \frac{\cosh^{2n+1} x}{\sinh^m x}\,dx = \sum_{\substack{k=0\\ k\neq (m-1)/2}}^{n} \binom{n}{k}\frac{\sinh^{2k-m+1} x}{2k-m+1} + s\binom{n}{(m-1)/2}\ln \sinh x,$$

where $s = 1$ for m odd and $m < 2n+1$, and $s = 0$ otherwise.

153. $$\int \frac{dx}{\sinh^{2m} x \cosh^{2n} x} = \sum_{k=0}^{m+n-1} \frac{(-1)^{k+1}}{2m-2k-1}\binom{m+n-1}{k}\tanh^{2k-2m+1} x.$$

154. $$\int \frac{dx}{\sinh^{2m+1} x \cosh^{2n+1} x} = \sum_{\substack{k=0\\ k\neq m}}^{n} \frac{(-1)^{k+1}}{2m-2k}\binom{m+n}{k}\tanh^{2k-2m} x + (-1)^m\binom{m+n}{m}\ln \tanh x.$$

155. $$\int \tanh^p x\,dx = -\frac{\tanh^{p-1} x}{p-1} + \int \tanh^{p-2} x\,dx, \quad p \neq 1.$$

156. $$\int \tanh^{2n+1} x\,dx = \sum_{k=1}^{n} \frac{(-1)^{k-1}}{2k}\binom{n}{k}\frac{1}{\cosh^{2k} x} + \ln \cosh x = -\sum_{k=1}^{n} \frac{\tanh^{2n-2k+2} x}{2n-2k+2} + \ln \cosh x.$$

157. $$\int \tanh^{2n} x\,dx = -\sum_{k=1}^{n} \frac{\tanh^{2n-2k+1} x}{2n-2k+1} + x.$$

158. $$\int \coth^p x\,dx = -\frac{\coth^{p-1} x}{p-1} + \int \coth^{p-2} x\,dx, \quad p \neq 1.$$

159. $$\int \coth^{2n+1} x\, dx = \begin{cases} -\displaystyle\sum_{k=1}^{n} \frac{1}{2n}\binom{n}{k}\frac{1}{\sinh^{2k} x} + \ln \sinh x, \\ \text{or} \\ -\displaystyle\sum_{k=1}^{n} \frac{\coth^{2n-2k+2} x}{2n-2k+2} + \ln \sinh x. \end{cases}$$

160. $$\int \coth^{2n} x\, dx = -\sum_{k=1}^{n} \frac{\coth^{2n-2k+1} x}{2n-2k+1} + x.$$

161. $$\int \sinh(ax+b)\sinh(cx+d)\, dx = \frac{1}{2(a+c)}\sinh[(a+c)x+b+d] - \frac{1}{2(a-c)}\sinh[(a-c)x+b-d], \quad a^2 \neq c^2.$$

162. $$\int \sinh(ax+b)\cosh(cx+d)\, dx = \frac{1}{2(a+c)}\cosh[(a+c)x+b+d] + \frac{1}{2(a-c)}\cosh[(a-c)x+b-d], \quad a^2 \neq c^2.$$

163. $$\int \cosh(ax+b)\cosh(cx+d)\, dx = \frac{1}{2(a+c)}\sinh[(a+c)x+b+d] + \frac{1}{2(a-c)}\sinh[(a-c)x+b-d], \quad a^2 \neq c^2.$$

164. $$\int \sinh(ax+b)\ \sinh(ax+d)\, dx = -\frac{x}{2}\cosh(b-d) + \frac{1}{4a}\sinh(2ax+b+d).$$

165. $$\int \sinh(ax+b)\ \cosh(ax+d)\, dx = \frac{x}{2}\sinh(b-d) + \frac{1}{4a}\cosh(2ax+b+d).$$

166. $$\int \cosh(ax+b)\ \cosh(ax+d)\, dx = \frac{x}{2}\cosh(b-d) + \frac{1}{4a}\sinh(2ax+b+d).$$

167. $$\int \sinh ax\ \sinh bx\ \sinh cx\ dx = \frac{\cosh(a+b+c)x}{4(a+b+c)} - \frac{\cosh(-a+b+c)x}{4(-a+b+c)} - \frac{\cosh(a-b+c)x}{4(a-b+c)} - \frac{\cosh(a+b-c)x}{4(a+b-c)}.$$

168. $$\int \sinh ax\ \sinh bx\ \cosh cx\, dx = \frac{\sinh(a+b+c)x}{4(a+b+c)} - \frac{\sinh(-a+b+c)x}{4(-a+b+c)} - \frac{\sinh(a-b+c)x}{4(a-b+c)} + \frac{\sinh(a+b-c)x}{4(a+b-c)}.$$

169. $$\int \sinh ax\ \cosh bx\ \cosh cx\, dx = \frac{\cosh(a+b+c)x}{4(a+b+c)} - \frac{\cosh(-a+b+c)x}{4(-a+b+c)} + \frac{\cosh(a-b+c)x}{4(a-b+c)} + \frac{\cosh(a+b-c)x}{4(a+b-c)}.$$

170. $$\int \cosh ax\, \cosh bx\, \cosh cx\, dx = \frac{\sinh(a+b+c)x}{4(a+b+c)} + \frac{\sinh(-a+b+c)x}{4(-a+b+c)} + \frac{\sinh(a-b+c)x}{4(a-b+c)} + \frac{\sinh(a+b-c)x}{4(a+b-c)}.$$

171. $$\int \sinh^p x\, \sinh\, ax\, dx = \frac{1}{p+a}\left\{\sinh^p x\, \cosh\, ax - p\int \sinh^{p-1} x\, \cosh(a-1)x\, dx\right\}.$$

172. $$\int \sinh^p x\, \sinh(2n+1)x\, dx = \frac{\Gamma(p+1)}{\Gamma\left(\frac{p+3}{2}+n\right)} \times\left\{\sum_{k=0}^{n-1}\left[\frac{\Gamma\left(\frac{p+1}{2}+n-2k\right)}{2^{2k+1}\Gamma\left(p-2k+1\right)}\sinh^{p-2k} x\, \cosh(2n-2k+1)x - \frac{\Gamma\left(\frac{p-1}{2}+n-2k\right)}{2^{2k+2}\Gamma\left(p-2k\right)}\sinh^{p-2k-1} x\, \sinh(2n-2k)x\right] + \frac{\Gamma\left(\frac{p+3}{2}-n\right)}{2^{2n}\Gamma\left(p+1-2n\right)}\int \sinh^{p-2n} x\, \sinh\, x\, dx\right\}, \quad p \geq 0 \text{ integer.}$$

173. $$\int \sinh^p x\, \sinh 2nx\, dx = \frac{\Gamma(p+1)}{\Gamma\left(\frac{p}{2}+n+1\right)} \times\sum_{k=0}^{n-1}\left[\frac{\Gamma\left(\frac{p}{2}+n-2k\right)}{2^{2k+1}\Gamma\left(p-2k+1\right)}\sinh^{p-2k} x\, \cosh(2n-2k)x - \frac{\Gamma\left(\frac{p}{2}+n-2k-1\right)}{2^{2k+2}\Gamma\left(p-2k\right)}\sinh^{p-2k-1} x\, \sinh(2n-2k-1)x\right], \quad p \geq 0 \text{ integer.}$$

174. $$\int \sinh^p x\, \cosh\, ax\, dx = \frac{1}{p+a}\left\{\sinh^p x\, \sinh\, ax - p\int \sinh^{p-1} x\, \sinh(a-1)x\, dx\right\}.$$

175. $$\int \sinh^p x\, \cosh(2n+1)x\, dx = \frac{\Gamma(p+1)}{\Gamma\left(\frac{p+3}{2}+n\right)} \times\left\{\sum_{k=0}^{n-1}\left[\frac{\Gamma\left(\frac{p+1}{2}+n-2k\right)}{2^{2k+1}\Gamma\left(p-2k+1\right)}\sinh^{p-2k} x\, \sinh(2n-2k+1)x - \frac{\Gamma\left(\frac{p-1}{2}+n-2k\right)}{2^{2k+2}\Gamma\left(p-2k\right)}\sinh^{p-2k-1} x\, \cosh(2n-2k)x\right] + \frac{\Gamma\left(\frac{p+3}{2}-n\right)}{2^{2n}\Gamma\left(p+1-2n\right)}\int \sinh^{p-2n} x\, \cosh\, x\, dx\right\}, \quad p \geq 0 \text{ integer.}$$

176. $$\int \sinh^p x\, \cosh 2nx\, dx = \frac{\Gamma(p+1)}{\Gamma\left(\frac{p}{2}+n+1\right)}$$
$$\times\left\{\sum_{k=0}^{n-1}\left[\frac{\Gamma\left(\frac{p}{2}+n-2k\right)}{2^{2k+1}\Gamma\left(p-2k+1\right)}\sinh^{p-2k} x\, \sinh(2n-2k)x\right.\right.$$
$$\left.-\frac{\Gamma\left(\frac{p}{2}+n-2k-1\right)}{2^{2k+2}\Gamma\left(p-2k\right)}\sinh^{p-2k-1} x\, \cosh(2n-2k-1)x\right]$$
$$\left.+\frac{\Gamma\left(\frac{p}{2}-n+1\right)}{2^{2n}\Gamma\left(p+1-2n\right)}\int \sinh^{p-2n} x\, dx\right\}, \quad p \geq 0 \text{ integer.}$$

177. $$\int \cosh^p x\, \sinh\, ax\, dx = \frac{1}{p+a}\left\{\cosh^p x\, \cosh\, ax + p\int \cosh^{p-1} x\, \sinh(a-1)x\, dx\right\}.$$

178. $$\int \cosh^p x\, \sinh(2n+1)x\, dx$$
$$= \frac{\Gamma(p+1)}{\Gamma\left(\frac{p+3}{2}+n\right)}\left\{\sum_{k=0}^{n-1}\frac{\Gamma\left(\frac{p+1}{2}+n-k\right)}{2^{k+1}\Gamma\left(p-k+1\right)}\cosh^{p-k} x\, \cosh(2n-k+1)x\right.$$
$$\left.+\frac{\Gamma\left(\frac{p+3}{2}\right)}{2^n\Gamma\left(p-n+1\right)}\int \cosh^{p-n} x\, \sinh(n+1)x\, dx\right\}, \quad p \geq 0 \text{ integer.}$$

179. $$\int \cosh^p x\, \sinh 2nx\, dx$$
$$= \frac{\Gamma(p+1)}{\Gamma\left(\frac{p}{2}+n+1\right)}\left\{\sum_{k=0}^{n-1}\frac{\Gamma\left(\frac{p}{2}+n-k\right)}{2^{k+1}\Gamma\left(p-k+1\right)}\cosh^{p-k} x\, \cosh(2n-k)x\right.$$
$$\left.+\frac{\Gamma\left(\frac{p}{2}+1\right)}{2^n\Gamma\left(p-n+1\right)}\int \cosh^{p-n} x\, \sinh nx\, dx\right\}, \quad p \geq 0 \text{ integer.}$$

180. $$\int \cosh^p x\, \cosh\, ax\, dx = \frac{1}{p+a}\left\{\cosh^p x\, \sinh\, ax + p\int \cosh^{p-1} x\, \cosh(a-1)x\, dx\right\}.$$

181. $$\int \cosh^p x\, \cosh(2n+1)x\, dx$$
$$= \frac{\Gamma(p+1)}{\Gamma\left(\frac{p+3}{2}+n\right)}\left\{\sum_{k=0}^{n-1}\frac{\Gamma\left(\frac{p+1}{2}+n-k\right)}{2^{k+1}\Gamma\left(p-k+1\right)}\cosh^{p-k} x\, \sinh(2n-k+1)x\right.$$
$$\left.+\frac{\Gamma\left(\frac{p+3}{2}\right)}{2^n\Gamma\left(p-n+1\right)}\int \cosh^{p-n} x\, \cosh(n+1)x\, dx\right\}, \quad p \geq 0 \text{ integer.}$$

182. $$\int \cosh^p x \, \cosh 2nx \, dx = \frac{\Gamma(p+1)}{\Gamma\left(\frac{p}{2}+n+1\right)} \left\{ \sum_{k=0}^{n-1} \frac{\Gamma\left(\frac{p}{2}+n-k\right)}{2^{k+1}\Gamma\left(p-k+1\right)} \cosh^{p-k} x \, \sinh(2n-k)x + \frac{\Gamma\left(\frac{p}{2}+1\right)}{2^n \Gamma\left(p-n+1\right)} \cosh^{p-n} x \, \cosh nx \, dx \right\}, \quad p \geq 0 \text{ integer.}$$

183. $$\int \sinh(n+1)x \, \sinh^{n-1} x \, dx = \frac{1}{n} \sinh^n x \, \sinh nx.$$

184. $$\int \sinh(n+1)x \, \cosh^{n-1} x \, dx = \frac{1}{n} \cosh^n x \, \cosh nx.$$

185. $$\int \cosh(n+1)x \, \sinh^{n-1} x \, dx = \frac{1}{n} \sinh^n x \, \cosh nx.$$

186. $$\int \cosh(n+1)x \, \cosh^{n-1} x \, dx = \frac{1}{n} \cosh^n x \, \sinh nx.$$