! For an efficient use of these tables, first read `HowTo.pdf`.

T3.30A. Integrands involving hyperbolic functions and algebraic functions on the interval $(0, \infty)$.

1. $$\int_0^\infty \frac{x\,dx}{\sinh ax} = \frac{\pi^2}{4a^2}, \quad a > 0.$$

2. $$\int_0^\infty \frac{x\,dx}{\cosh x} = 2\mathbf{G} \approx 1.831931188.$$

3. $$\int_0^\infty \frac{x\,dx}{(b^2+x^2)\,\sinh ax} = \frac{\pi}{2ab} + \pi \sum_{k=1}^{\infty} \frac{(-1)^k}{ab+k\pi}, \quad a>0,\ b>0.$$

4. $$\int_0^\infty \frac{x\,dx}{(b^2+x^2)\,\sinh \pi x} = \frac{1}{2b} - \beta(b+1), \quad b>0.$$

5. $$\int_0^\infty \frac{dx}{(b^2+x^2)\,\cosh ax} = \frac{2\pi}{b} \sum_{k=1}^{\infty} \frac{(-1)^{k-1}}{2ab+(2k-1)\pi}, \quad a>0,\ b>0.$$

6. $$\int_0^\infty \frac{dx}{(b^2+x^2)\,\cosh \pi x} = \frac{1}{b}\,\beta\left(b+\frac{1}{2}\right), \quad b>0.$$

7. $$\int_0^\infty \frac{x\,dx}{(1+x^2)\,\sinh \pi x} = \ln 2 - \frac{1}{2}.$$

8. $$\int_0^\infty \frac{dx}{(1+x^2)\,\cosh \pi x} = 2 - \frac{\pi}{2}.$$

9. $$\int_0^\infty \frac{x\,dx}{(1+x^2)\,\sinh(\pi x/2)} = \frac{\pi}{2} - 1.$$

10. $$\int_0^\infty \frac{dx}{(1+x^2)\,\cosh(\pi x/2)} = \ln 2.$$

11. $\displaystyle\int_0^\infty \frac{x\,dx}{(1+x^2)\,\sinh(\pi x/4)} = \frac{1}{\sqrt{2}}\left[\pi + 2\,\ln(\sqrt{2}+1)\right] - 2.$

12. $\displaystyle\int_0^\infty \frac{dx}{(1+x^2)\,\cosh(\pi x/4)} = \frac{1}{\sqrt{2}}\left[\pi - 2\,\ln(\sqrt{2}+1)\right].$

13. $\displaystyle\int_0^\infty \frac{x^{\beta-1}}{\sinh ax}\,dx = \frac{2^\beta - 1}{2^{\beta-1}a^\beta}\,\Gamma(\beta)\,\zeta(\beta), \quad \Re\{\beta\} > 1,\ a > 0.$

14. $\displaystyle\int_0^\infty \frac{x^{2n-1}}{\sinh ax}\,dx = \frac{2^{2n}-1}{2n}\left(\frac{\pi}{a}\right)^{2n}|B_{2n}|, \quad a > 0,\ n = 1, 2, \ldots.$

15. $$\int_0^\infty \frac{x^{\beta-1}}{\cosh ax}\,dx = \frac{2}{(2a)^\beta}\Gamma(\beta)\Phi\left(-1,\,\beta,\,\tfrac{1}{2}\right)$$
$$= \frac{2}{(2a)^\beta}\Gamma(\beta)\sum_{k=0}^{\infty}(-1)^k\left(\frac{2}{2k+1}\right)^\beta, \quad \Re\{\beta\} > 0,\ a > 0.$$

16. $\displaystyle\int_0^\infty \frac{x^{2n}}{\cosh ax}\,dx = \left(\frac{\pi}{2a}\right)^{2n+1}|E_{2n}|, \quad a > 0.$

17. $\displaystyle\int_0^\infty \frac{x^2\,dx}{\cosh x} = \frac{\pi^3}{8}.$

18. $\displaystyle\int_0^\infty \frac{x^3\,dx}{\sinh x} = \frac{\pi^4}{8}.$

19. $\displaystyle\int_0^\infty \frac{x^4\,dx}{\cosh x} = \frac{5\,\pi^5}{32}.$

20. $\displaystyle\int_0^\infty \frac{x^5}{\sinh x}\,dx = \frac{\pi^6}{4}.$

21. $\displaystyle\int_0^\infty \frac{x^6}{\cosh x}\,dx = \frac{61\,\pi^7}{128}.$

22. $\displaystyle\int_0^\infty \frac{x^7}{\sinh x}\,dx = \frac{17\,\pi^8}{16}.$

23. $\displaystyle\int_0^\infty \frac{\sqrt{x}\,dx}{\cosh x} = \sqrt{\pi}\sum_{k=0}^\infty (-1)^k \frac{1}{\sqrt{(2k+1)^3}}.$

24. $\displaystyle\int_0^\infty \frac{dx}{\sqrt{x}\,\cosh x} = 2\sqrt{\pi}\sum_{k=0}^\infty \frac{(-1)^k}{\sqrt{2k+1}}.$

25. $\displaystyle\int_0^\infty x^{\mu-1}\frac{\sinh\beta x}{\sinh\gamma x}\,dx = \frac{\Gamma(\mu)}{(2\gamma)^\mu}\left\{\zeta\left[\mu,\,\frac{1}{2}\left(1-\frac{\beta}{\gamma}\right)\right] - \zeta\left[\mu,\,\frac{1}{2}\left(1+\frac{\beta}{\gamma}\right)\right]\right\},$

$\Re\{\gamma\} > |\Re\{\beta\}|,\ \Re\{\mu\} > -1.$

26. $\displaystyle\int_0^\infty x^{2^m}\frac{\sinh ax}{\sinh bx}\,dx = \frac{\pi}{2b}\frac{d^{2m}}{da^{2m}}\,\tan\left(\frac{a\pi}{2b}\right), \quad b > |a|.$

27. $\displaystyle\int_0^\infty \frac{\sinh ax}{\sinh bx}\frac{dx}{x^p} = \Gamma(1-p)\sum_{k=0}^\infty\left\{\frac{1}{[b(2k+1)-a]^{1-p}} - \frac{1}{[b(2k+1)+a]^{1-p}}\right\},$

$b > |a|,\ p < 1.$

28. $\displaystyle\int_0^\infty x^{2^m+1}\frac{\sinh ax}{\cosh bx}\,dx = \frac{\pi}{2b}\,\frac{d^{2m+1}}{da^{2m+1}}\,\sec\left(\frac{a\pi}{2b}\right), \quad b > |a|.$

29. $\displaystyle\int_0^\infty x^{\mu-1}\frac{\cosh\beta x}{\sinh\gamma x}\,dx = \frac{\Gamma(\mu)}{(2\gamma)^\mu}\left\{\zeta\left[\mu,\,\frac{1}{2}\left(1-\frac{\beta}{\gamma}\right)\right] + \zeta\left[\mu,\,\frac{1}{2}\left(1+\frac{\beta}{\gamma}\right)\right]\right\},$

$\Re\{\gamma\} > |\Re\{\beta\}|,\ \Re\{\mu\}1.$

30. $\displaystyle\int_0^\infty x^{2m}\frac{\cosh ax}{\cosh bx}\,dx = \frac{\pi}{2b}\,\frac{d^{2m}}{da^{2m}}\,\sec\left(\frac{a\pi}{2b}\right), \quad b > |a|.$

31. $\displaystyle\int_0^\infty \frac{\cosh ax}{x^p\,\cosh bx}\,dx = \Gamma(1-p)\sum_{k=0}^\infty(-1)^k\left\{\frac{1}{[b(2k+1)-a]^{1-p}} + \frac{1}{[b(2k+1)+a]^{1-p}}\right\},$

$b > |a|,\ p < 1.$

32. $\displaystyle\int_0^\infty x^{2m+1}\frac{\cosh ax}{\sinh bx}\,dx = \frac{\pi}{2b}\,\frac{d^{2m+1}}{da^{2m+1}}\,\tan\left(\frac{a\pi}{2b}\right), \quad b > |a|.$

33. $\displaystyle\int_0^\infty x^2\frac{\sinh ax}{\sinh bx}\,dx = \frac{\pi^3}{4b^3}\,\sin\,\frac{a\pi}{2b}\,\sec^3\left(\frac{a\pi}{2b}\right), \quad b > |a|.$

34. $$\int_0^\infty x^4 \frac{\sinh ax}{\sinh bx}\, dx = 8 \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^5 \sin\left(\frac{a\pi}{2b}\right) \cdot \left(2 + \sin^2 \frac{a\pi}{2b}\right), \quad b > |a|.$$

35. $$\int_0^\infty x^6 \frac{\sinh ax}{\sinh bx}\, dx = 16 \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^7 \sin\left(\frac{a\pi}{2b}\right) \cdot \left(45 - 30 \cos^2 \frac{a\pi}{2b} + 2 \cos^4 \frac{a\pi}{2b}\right), \quad b > |a|.$$

36. $$\int_0^\infty x \frac{\sinh ax}{\cosh bx}\, dx = \frac{\pi^2}{4b^2} \sin\left(\frac{a\pi}{2b}\right) \sec^2\left(\frac{a\pi}{2b}\right), \quad b > |a|.$$

37. $$\int_0^\infty x^3 \frac{\sinh ax}{\cosh bx}\, dx = \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^4 \sin\left(\frac{a\pi}{2b}\right) \cdot \left(6 - \cos^2 \frac{a\pi}{2b}\right), \quad b > |a|.$$

38. $$\int_0^\infty x^5 \frac{\sinh ax}{\cosh bx}\, dx = \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^6 \sin\left(\frac{a\pi}{2b}\right) \cdot \left(120 - 60 \cos^2 \frac{a\pi}{2b} + \cos^4 \frac{a\pi}{2b}\right), \quad b > |a|.$$

39. $$\int_0^\infty x^7 \frac{\sinh ax}{\cosh bx}\, dx = \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^8 \sin\left(\frac{a\pi}{2b}\right) \cdot \left(5040 - 4200 \cos^2 \frac{a\pi}{2b} + 546 \cos^4 \frac{a\pi}{2b} - \cos^6 \frac{a\pi}{2b}\right),$$
$$b > |a|.$$

40. $$\int_0^\infty x \frac{\cosh ax}{\sinh bx}\, dx = \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^2, \quad b > |a|.$$

41. $$\int_0^\infty x^3 \frac{\cosh ax}{\sinh bx}\, dx = 2 \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^4 \left(1 + 2 \sin^2 \frac{a\pi}{2b}\right), \quad b > |a|.$$

42. $$\int_0^\infty x^5 \frac{\cosh ax}{\sinh bx}\, dx = 8 \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^6 \left(15 - 15 \cos^2 \frac{a\pi}{2b} + 2 \cos^4 \frac{a\pi}{2b}\right), \quad b > |a|.$$

43. $$\int_0^\infty x^7 \frac{\cosh ax}{\sinh bx}\, dx = 16 \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^8 \left(315 - 420 \cos^2 \frac{a\pi}{2b} + 126 \cos^4 \frac{a\pi}{2b} - 4 \cos^6 \frac{a\pi}{2b}\right),$$
$$b > |a|.$$

44. $$\int_0^\infty x^2 \frac{\cosh ax}{\cosh bx}\, dx = \frac{\pi^3}{8b^3} \left(2 \sec^3 \frac{a\pi}{2b} - \sec \frac{a\pi}{2b}\right), \quad b > |a|.$$

45. $$\int_0^\infty x^4 \frac{\cosh ax}{\cosh bx}\, dx = \left(\frac{\pi}{2b} \sec \frac{a\pi}{2b}\right)^5 \left(24 - 20 \cos^2 \frac{a\pi}{2b} + \cos^4 \frac{a\pi}{2b}\right), \quad b > |a|.$$

46. $\displaystyle\int_0^\infty x^6 \frac{\cosh ax}{\cosh bx}\,dx = \left(\frac{\pi}{2b}\sec\frac{a\pi}{2b}\right)^7 \left(720 - 840\cos^2\frac{a\pi}{2b} + 182\cos^4\frac{a\pi}{2b} - \cos^6\frac{a\pi}{2b}\right),$
$b > |a|.$

47. $\displaystyle\int_0^\infty \frac{\sinh ax}{\cosh bx}\cdot\frac{dx}{x} = \ln\tan\left(\frac{a\pi}{4b} + \frac{\pi}{4}\right), \quad b > |a|.$

48. $\displaystyle\int_0^\infty \frac{\sinh ax}{\sinh \pi x}\cdot\frac{dx}{1+x^2} = -\frac{a}{2}\cos a + \frac{1}{2}\sin a\,\ln[2(1+\cos a)], \quad \pi \ge |a|.$

49. $\displaystyle\int_0^\infty \frac{\sinh ax}{\sinh \frac{\pi}{2}x}\cdot\frac{dx}{1+x^2} = \frac{\pi}{2}\sin a + \frac{1}{2}\cos a\,\ln\frac{1-\sin a}{1+\sin a}, \quad \pi \ge 2|a|.$

50. $\displaystyle\int_0^\infty \frac{\cosh ax}{\sinh \pi x}\cdot\frac{x\,dx}{1+x^2} = \frac{1}{2}(a\sin a - 1) + \frac{1}{2}\cos a\,\ln[2(1+\cos a)], \quad \pi > |a|.$

51. $\displaystyle\int_0^\infty \frac{\cosh ax}{\sinh \frac{\pi}{2}x}\cdot\frac{x\,dx}{1+x^2} = \frac{\pi}{2}\cos a - 1 + \frac{1}{2}\sin a\,\ln\frac{1+\sin a}{1-\sin a}, \quad \frac{\pi}{2} > |a|.$

52. $\displaystyle\int_0^\infty \frac{\sinh ax}{\cosh \pi x}\cdot\frac{x\,dx}{1+x^2} = -2\sin\frac{a}{2} + \frac{\pi}{2}\sin a - \cos a\,\ln\tan\frac{a+\pi}{4}, \quad \pi > |a|.$

53. $\displaystyle\int_0^\infty \frac{\cosh ax}{\cosh \pi x}\cdot\frac{dx}{1+x^2} = 2\cos\frac{a}{2} - \frac{\pi}{2}\cos a - \sin a\,\ln\tan\frac{a+\pi}{4}, \quad \pi > |a|.$

54. $\displaystyle\int_0^\infty \frac{\sinh ax}{\sinh bx}\cdot\frac{dx}{c^2+x^2} = \frac{\pi}{c}\sum_{k=1}^{\infty}\frac{\sin\frac{k(b-a)}{b}\pi}{bc+k\pi}, \quad b \ge |a|.$

55. $\displaystyle\int_0^\infty \frac{\cosh ax}{\sinh bx}\cdot\frac{x\,dx}{c^2+x^2} = \frac{\pi}{2bc} + \pi\sum_{k=1}^{\infty}\frac{\cos\frac{k(b-a)}{b}\pi}{bc+k\pi}, \quad b > |a|.$

56. $\displaystyle\int_0^\infty \frac{\sinh ax\,\cosh bx}{x\,\cosh cx}\,dx = \frac{1}{2}\ln\left\{\tan\frac{(a+b+c)\pi}{4c}\,\cot\frac{(b+c-a)\pi}{4c}\right\}, \quad c > |a| + |b|.$

57. $\displaystyle\int_0^\infty \frac{\sinh^2 ax}{x\,\sinh bx}\,dx = \frac{1}{2}\ln\sec\left(\frac{a\,\pi}{b}\right), \quad b > |2a|.$

58. $$\int_0^\infty \frac{x^{\mu-1}}{\sinh\beta x\,\cosh\gamma x}\,dx = \frac{\Gamma(\mu)}{(2\gamma)^\mu}\left\{\Phi\left[-1,\,\mu,\,\frac{1}{2}\left(1+\frac{\beta}{\gamma}\right)\right]+\Phi\left[-1,\,\mu,\,\frac{1}{2}\left(1-\frac{\beta}{\gamma}\right)\right]\right\},$$ $$\Re\{\gamma\} > |\Re\{\beta\}|,\ \Re\{\mu\} > 0.$$

59. $$\int_0^\infty \frac{x^{\mu-1}}{\sinh^2 ax}\,dx = \frac{4}{(2a)^\mu}\Gamma(\mu)\zeta(\mu-1), \quad \Re\{a\} > 0, \Re\{\mu\} > 2.$$

60. $$\int_0^\infty \frac{x^{2m}}{\sinh^2 ax}\,dx = \frac{\pi^{2m}}{a^{2m+1}}|B_{2m}|, \quad a > 0,\, m = 1,\, 2, \ldots.$$

61. $$\int_0^\infty \frac{x^{\mu-1}}{\cosh^2 ax}\,dx = \begin{cases} \dfrac{4}{(2a)^\mu}(1-2^{2-\mu})\Gamma(\mu)\,\zeta(\mu-1), & \mu \neq 2, \\ (1/a^2)\,\ln 2, & \mu = 2, \end{cases} \qquad \Re\{a\} > 0,\ \Re\{\mu\} > 0.$$

62. $$\int_0^\infty \frac{x\,dx}{\cosh^2 ax} = \frac{\ln 2}{a^2}, \quad a \neq 0.$$

63. $$\int_0^\infty \frac{x^{2m}}{\cosh^2 ax}\,dx = \frac{(2^{2m}-2)\pi^{2m}}{(2a)^{2m}a}|B_{2m}|, \quad a > 0,\, m = 1,\, 2, \ldots.$$

64. $$\int_0^\infty x^{\mu-1}\frac{\sinh ax}{\cosh^2 ax}\,dx = \frac{2\Gamma(\mu)}{a^\mu}\sum_{k=0}^\infty \frac{(-1)^k}{(2k+1)^{\mu-1}}, \quad \Re\{\mu\} > 1,\ a > 0.$$

65. $$\int_0^\infty \frac{x\,\sinh ax}{\cosh^2 ax}\,dx = \frac{\pi}{2a^2}, \quad a > 0.$$

66. $$\int_0^\infty x^{2m+1}\frac{\sinh ax}{\cosh^2 ax}\,dx = \frac{2m+1}{a}\left(\frac{\pi}{2a}\right)^{2m+1}|E_{2m}|, \quad a > 0,\, m = 0,\, 1, \ldots.$$

67. $$\int_0^\infty x^{2m+1}\frac{\cosh ax}{\sinh^2 ax}\,dx = \frac{2^{2m+1}-1}{a^2(2a)^{2m}}(2m+1)!\,\zeta(2m+1), \quad a \neq 0,\ m = 1,\, 2, \ldots.$$

68. $$\int_0^\infty x^{2m}\frac{\cosh ax}{\sinh^2 ax}\,dx = \frac{2^{2m}1}{a}\left(\frac{\pi}{a}\right)^{2m}|B_{2m}|, \quad a > 0,\, m = 1,\, 2, \ldots.$$

69. $$\int_0^\infty \frac{x\,\sinh ax}{\cosh^{2\mu+1} ax}\,dx = \frac{\sqrt{\pi}}{4\mu a^2}\,\frac{\Gamma(\mu)}{\left(\mu+\frac{1}{2}\right)}, \quad \mu > 0,\, a > 0.$$

70. $$\int_{-\infty}^\infty \frac{x^2\,dx}{\sinh^2 x} = \frac{\pi^2}{3}.$$

71. $\displaystyle\int_0^\infty x^2 \frac{\cosh ax}{\sinh^2\, ax}\, dx = \frac{\pi^2}{2a^3}, \quad a > 0.$

72. $\displaystyle\int_0^\infty x^2 \frac{\sinh ax}{\cosh^2\, ax}\, dx = \frac{\ln 2}{2a^3}, \quad a \neq 0.$

73. $\displaystyle\int_0^\infty \frac{\tanh \frac{x}{2}\, dx}{\cosh x} = \ln 2.$

74. $\displaystyle\int_0^\infty \frac{(1+i\,x)^{2n-1} - (1-i\,x)^{2n-1}}{i\,\sinh(\pi x/2)}\, dx = 2.$

75. $\displaystyle\int_0^\infty \frac{(1+i\,x)^{2n} - (1-i\,x)^{2n}}{i\,\sinh(\pi x/2)}\, dx = (-1)^{n+1}\, 2|E_{2n}| + 2, \quad n = 0,\, 1, \ldots .$

76. $\displaystyle\int_0^\infty \left(\frac{1}{\sinh x} - \frac{1}{x}\right)\frac{dx}{x} = -\ln 2.$

77. $\displaystyle\int_0^\infty \frac{\cosh ax - 1}{\sinh bx}\,\frac{dx}{x} = -\ln\cos\frac{a\pi}{2b}, \quad b > |a|.$

78. $\displaystyle\int_0^\infty \left(\frac{a}{\sinh ax} - \frac{b}{\sinh bx}\right)\frac{dx}{x} = (b-a)\,\ln 2.$

79. $\displaystyle\int_0^\infty \frac{x\, dx}{2\,\cosh x - 1} = \frac{4}{\sqrt{3}}\left[\frac{\pi}{3}\,\ln 2 - L(\pi/3)\right].$

80. $\displaystyle\int_0^\infty \frac{x\, dx}{\cosh 2x + \cos 2t} = \frac{t\,\ln 2 - L(t)}{\sin 2t}.$

81. $\displaystyle\int_0^\infty \frac{x^2\, dx}{\cosh x + \cos t} = \frac{t}{3}\,\frac{\pi^2 - t^2}{\sin t}, \quad 0 < t < \pi.$

82. $\displaystyle\int_0^\infty \frac{x^4\, dx}{\cosh x + \cos t} = \frac{t}{15}\frac{(\pi^2 - t^2)(7\pi^2 - 3t^2)}{\sin t}, \quad 0 < t < \pi.$

83. $\displaystyle\int_0^\infty \frac{x^{2m}\, dx}{\cosh x - \cos 2a\pi} = \begin{cases} 2(2m)!\,\csc 2a\pi \displaystyle\sum_{k=1}^{\infty} \frac{\sin 2ka\pi}{k^{2m+1}}, & 0 < a < 1,\ a \neq \frac{1}{2}, \\ 2(2^{2m-1} - 1)\pi^{2m}|B_{2m}|, & a = \frac{1}{2}. \end{cases}$

84. $$\int_0^\infty \frac{x^{\mu-1}\,dx}{\cosh x - \cos t} = \begin{cases} \dfrac{i\,\Gamma(\mu)}{\sin t}\left[e^{-it}\Phi(e^{-it},\,\mu,\,1) - e^{it}\Phi(e^{it},\,\mu,\,1)\right], & 0 < t < 2\pi,\ t \neq \pi, \\ \left(2 - 2^{3-\mu}\right)\,\Gamma(\mu)\,\zeta(\mu-1), & \mu \neq 2,\ t = \pi, \\ 2\,\ln 2, & \mu = 2,\ t = \pi, \end{cases} \quad \Re\{\mu\} > 0.$$

85. $$\int_0^\infty \frac{x^\mu\,dx}{\cosh x + \cos t} = \frac{2\Gamma(\mu+1)}{\sin t}\sum_{k=1}^\infty (-1)^{k-1}\frac{\sin kt}{k^{\mu+1}}, \quad \mu > -1,\ 0 < t < \pi.$$

86. $$\int_0^\infty \frac{x^n\,dx}{a\,\cosh x + b\,\sinh x} = \frac{(2n)!}{a+b}\sum_{k=0}^\infty \frac{1}{(2k+1)^{n+1}}\left(\frac{b-a}{b+a}\right)^k, \quad a > 0,\ b > 0,\ n > -1.$$

87. $$\int_0^\infty \frac{x\,\cosh x\,dx}{\cosh 2x - \cos 2t} = \csc t\left[\frac{\pi}{2}\,\ln 2 - L\left(\frac{t}{2}\right) - L\left(\frac{\pi - t}{2}\right)\right], \quad t \neq m\pi.$$

88. $$\int_0^\infty \frac{x\,\sinh ax\,dx}{(\cosh ax - \cos t)^2} = \frac{\pi - t}{a^2}\,\csc t, \quad a > 0,\ 0 < t < \pi.$$

89. $$\int_0^\infty x^3\frac{\sinh x\,dx}{(\cosh x + \cos t)^2} = \frac{t(\pi^2 - t^2)}{\sin t}, \quad 0 < t < \pi.$$

90. $$\int_0^\infty x^{2^m+1}\frac{\sinh x\,dx}{(\cosh x - \cos 2a\pi)^2} = \begin{cases} 2(2m+1)!\,\csc 2a\pi\displaystyle\sum_{k=1}^\infty \frac{\sin 2ka\pi}{k^{2m+1}}, & 0 < a < 1,\ a \neq \tfrac{1}{2}, \\ 2(2m+1)(2^{2m-1}-1)\pi^{2m}|B_{2m}|, & a = \tfrac{1}{2}. \end{cases}$$

91. $$\int_0^\infty \frac{x^2}{\cosh x^2}\,dx = \frac{\sqrt{\pi}}{2}\sum_{k=0}^\infty \frac{(-1)^k}{\sqrt{(2k+1)^3}}.$$

92. $$\int_0^\infty \frac{x^2\,\tanh x^2\,dx}{\cosh x^2} = \frac{\sqrt{\pi}}{2}\sum_{k=0}^\infty \frac{(-1)^k}{\sqrt{2k+1}}.$$

93. $$\int_0^\infty \sinh(\nu\,\operatorname{arcsinh} x)\frac{x^{\mu-1}}{\sqrt{1+x^2}}\,dx = \frac{\sin(\mu\pi/r2)\,\sin(\nu\pi/2)}{2^\mu\pi}\,\Gamma(\mu)\Gamma\left(\frac{1-\mu-\nu}{2}\right)\,\Gamma\left(\frac{1-\mu+\nu}{2}\right),$$
$$-1 < \Re\{\mu\} < 1 - |\Re\{\nu\}|.$$

94. $$\int_0^\infty \cosh(\nu\ \operatorname{arcsinh} x)\frac{x^{\mu-1}}{\sqrt{1+x^2}}\,dx = \frac{\cos(\mu\pi/r2)\ \cos(\nu\pi/2)}{2^\mu\pi}\,\Gamma(\mu)\Gamma\left(\frac{1-\mu-\nu}{2}\right)\,\Gamma\left(\frac{1-\mu+\nu}{2}\right),$$
$$0<\Re\{\mu\}<1-|\Re\{\nu\}|.$$