

PROOF OF FORMULA 3.419.1

$$\int_{-\infty}^{\infty} \frac{x dx}{(a + e^x)(1 + e^{-x})} = \frac{\ln^2 a}{2(a - 1)}$$

The change of variables $x = \ln v$ yields

$$\int_{-\infty}^{\infty} \frac{x dx}{(a + e^x)(1 + e^{-x})} = \int_0^{\infty} \frac{\ln v dv}{(v + a)(v + 1)}.$$

The result now follows from entry 4.232.2 that states

$$\int_0^{\infty} \frac{\ln x dx}{(x + a)(x + b)} = \frac{\ln^2 a - \ln^2 b}{2(a - b)}.$$