

PROOF OF FORMULA 3.524.23

$$\int_0^{\infty} \frac{\sinh ax}{\cosh bx} \frac{dx}{x} = \ln \tan \left(\frac{\pi a}{4b} + \frac{\pi}{4} \right)$$

Entry 3.511.4 states that

$$\int_0^{\infty} \frac{\cosh ax}{\cosh bx} dx = \frac{\pi}{2b} \sec \frac{\pi a}{2b}.$$

Integrate with respect to a and use

$$\int \sec x dx = \ln \tan \left(\frac{x}{2} + \frac{\pi}{4} \right)$$

to obtain the result.