PROOF OF FORMULA 3.524.8

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

Entry 3.511.2 states that

$$\int_0^\infty \frac{\sinh ax}{\sinh bx}\,dx = \frac{\pi}{2b}\tan\frac{\pi a}{2b}.$$

The result now follows by differentiation.