PROOF OF FORMULA 3.524.18

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

Entry 3.524.8 states that

$$\int_0^\infty x^5 \frac{\cosh ax}{\sinh bx}\,dx = \frac{\pi}{2b}\left(\frac{d}{da}\right)^5 \tan\frac{\pi a}{2b}.$$

The result comes from computing the derivative.