PROOF OF FORMULA 3.524.11

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

Entry 3.524.2 states that

$$\int_0^\infty x^6 \frac{\sinh ax}{\sinh bx}\,dx = \frac{\pi}{2b}\left(\frac{d}{da}\right)^6 \tan\left(\frac{\pi a}{2b}\right).$$

The result follows by computing the derivative.