PROOF OF FORMULA 3.523.8

$$\int_0^\infty \frac{x^5\,dx}{\sinh x} = \frac{\pi^6}{4}$$

Formula 3.523.2 states that

$$\int_0^\infty \frac{x^{2n-1}\,dx}{\sinh ax} = \frac{2^{2n}-1}{2n}\left(\frac{\pi}{a}\right)^{2n}|B_{2n}|.$$

The special case $n = 3$ and $a = 1$, using the value $B_6 = 1/42$ give the result.