PROOF OF FORMULA 3.522.7

$$\int_0^\infty \frac{x\,dx}{(1+x^2)\sinh\frac{\pi x}{2}} = \frac{\pi}{2} - 1$$

This is the special case $a = \pi/2$ and $b = 1$ of entry **3.522.1**. It yields

$$\int_0^\infty \frac{x\,dx}{(1+x^2)\sinh\frac{\pi x}{2}} = 1 + 2\sum_{k=1}^\infty \frac{(-1)^k}{2k+1}.$$

The result follows from the expansion

$$\sum_{k=0}^\infty \frac{(-1)^k}{2k+1} = \frac{\pi}{4}.$$