PROOF OF FORMULA 3.628

$$\int_0^{\pi/2} \sec^{2p} x \, \sin^{2p-1} x \, dx = \frac{1}{2\pi p}\Gamma(p+1)\Gamma\left(\tfrac{1}{2}-p\right)$$

The integral representation

$$B(a,b) = 2\int_0^{\pi/2} \sin^{2a-1} x \, \cos^{2b-1} x \, dx$$

gives the value

$$\int_0^{\pi/2} \sec^{2p} x \, \sin^{2p-1} x \, dx = \frac{1}{2} B(p, \tfrac{1}{2}-p).$$

This reduces to the answer given here, using

$$B(a,b) = \frac{\Gamma(a)\,\Gamma(b)}{\Gamma(a+b)}.$$