PROOF OF FORMULA 3.747.9

$$\int_0^{\pi/2} \left(\frac{\pi}{2} - x\right) \tan x \, dx = \frac{1}{2} \int_0^{\pi} \left(\frac{\pi}{2} - x\right) \tan x \, dx = \frac{\pi}{2} \ln 2$$

Let $s = \frac{\pi}{2} - x$ to obtain

$$\int_0^{\pi/2} \left(\frac{\pi}{2} - x\right) \tan x \, dx = \int_0^{\pi/2} s \, \cot s \, ds.$$

Write

$$\cot s = \frac{d}{ds} \ln \sin s$$

to integrate by parts. The result now follows from entry 4.224.3

$$\int_0^{\pi/2} \ln \sin s \, ds = -\frac{\pi}{2} \ln 2.$$