

$$y' = 2 \csc x \cot x, \quad y\left(\frac{\pi}{2}\right) = 1$$

Integrate:

$$y = \int 2 \csc x \cot x \, dx$$

* note, $\frac{d}{dx}(\csc x) = -\csc x \cot x$

$$\int 2 \csc x \cot x \, dx = -2 \csc x + C$$

Apply initial value:

$$y\left(\frac{\pi}{2}\right) = -2 \csc\left(\frac{\pi}{2}\right) + C = 1$$

$$-2 + C = 1$$

$$C = 3$$

so,

$$y = -2 \csc x + 3$$