Exercise 18

Differentiate the function.

$$y = \ln(\csc x - \cot x)$$

Solution

Take the derivative of the function.

$$\begin{aligned}
y' &= \frac{d}{dx}\left[\ln(\csc x - \cot x)\right] \\
&= \frac{1}{\csc x - \cot x} \cdot \frac{d}{dx}(\csc x - \cot x) \\
&= \frac{1}{\csc x - \cot x} \cdot \left[\frac{d}{dx}(\csc x) - \frac{d}{dx}(\cot x)\right] \\
&= \frac{1}{\csc x - \cot x} \cdot \left[(-\csc x \cot x) - (-\csc^2 x)\right] \\
&= \frac{1}{\csc x - \cot x} \cdot (\csc^2 x - \csc x \cot x) \\
&= \frac{\csc x}{\csc x - \cot x} \cdot (\csc x - \cot x) \\
&= \csc x
\end{aligned}$$