Exercise 4

Differentiate the function.

$$f(x) = \ln(\sin^2 x)$$

Solution

Take the derivative of the function using the chain rule.

$$
\begin{aligned}
f'(x) &= \frac{d}{dx}[\ln(\sin^2 x)] \\[2mm]
&= \frac{1}{\sin^2 x} \cdot \frac{d}{dx}(\sin^2 x) \\[2mm]
&= \frac{1}{\sin^2 x} \cdot (2\sin x) \cdot \frac{d}{dx}(\sin x) \\[2mm]
&= \frac{1}{\sin^2 x} \cdot (2\sin x) \cdot (\cos x) \\[2mm]
&= \frac{2\sin x \cos x}{\sin^2 x} \\[2mm]
&= \frac{2\cos x}{\sin x} \\[2mm]
&= 2\cot x
\end{aligned}
$$