

**Exercise 18**

Prove that  $\frac{d}{dx}(\sec x) = \sec x \tan x$ .

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**Solution**

Use the quotient rule to differentiate the function.

$$\begin{aligned}\frac{d}{dx}(\sec x) &= \frac{d}{dx} \left( \frac{1}{\cos x} \right) \\ &= \frac{\left[ \frac{d}{dx}(1) \right] \cos x - 1 \left[ \frac{d}{dx}(\cos x) \right]}{(\cos x)^2} \\ &= \frac{(0) \cos x - 1(-\sin x)}{\cos^2 x} \\ &= \frac{\sin x}{\cos^2 x} \\ &= \frac{1}{\cos x} \frac{\sin x}{\cos x} \\ &= \sec x \tan x\end{aligned}$$