

Exercise 25

Find y' and y'' .

$$y = \ln |\sec x|$$

Solution

Let $u = \sec x$.

$$y = \ln |u|$$

Take the derivative of the function with respect to x by using the chain rule.

$$\begin{aligned} y' &= \frac{d}{dx} (\ln |u|) \\ &= \frac{du}{dx} \frac{d}{du} (\ln |u|) \\ &= \left[\frac{d}{dx} (\sec x) \right] \left(\frac{1}{u} \right) \\ &= (\sec x \tan x) \left(\frac{1}{\sec x} \right) \\ &= \tan x \end{aligned}$$

Take another derivative.

$$\begin{aligned} y'' &= \frac{d}{dx} (y') \\ &= \frac{d}{dx} (\tan x) \\ &= \sec^2 x \end{aligned}$$