Exercise 23

Calculate y'.

$$y = (1 - x^{-1})^{-1}$$

Solution

Calculate y' by using the chain rule.

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