4.3.1 Theorem  (Differentiability of Inverse Functions)

Suppose that the domain of a function $f$ is an open interval $I$ and that $f$ is differentiable and one-to-one on this interval. Then $f^{-1}$ is differentiable at any point $x$ in the range of $f$ at which $f'(f^{-1}(x)) \neq 0$, and its derivative is

$$
\frac{d}{dx} \left[ f^{-1}(x) \right] = \frac{1}{f'(f^{-1}(x))}
$$

or

$$
\left( f^{-1} \right)'(x) = \frac{1}{f'(f^{-1}(x))}
$$

Suppose $(a,b)$ is a point on $y = f(x)$, so $f(a) = b$, Then $(f^{-1})'(b) = \frac{1}{f'(a)}$

Or, in an easier form to understand and use:

$$
\frac{dy}{dx} = \frac{1}{\frac{dx}{dy}}
$$