7.8.6.) Define an interval $[a, b]$, and let f be continuous on $[a, b]$ and differentiable on (a, b). In addition, suppose f satisfies the Lipschitz condition, thus for all $x, y \in [a, b]$, there exists $M \in \mathbb{R}$ where

$$|f(x) - f(y)| \leq M\,|x - y|$$

thus

$$\frac{|f(x) - f(y)|}{|x - y|} = \left|\frac{f(x) - f(y)}{x - y}\right| \leq M$$

We can take the limit to find $f'(y)$:

$$f'(y) = \lim_{x \to y} \left|\frac{f(x) - f(y)}{x - y}\right|$$