Assignment 5 - Derivatives

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1. Define derivative of a function at a point a. What does it mean for a function to be differentiable?
2. Show that $f(x) = |x|$ is not differentiable at $x = 0$.
3. Show that $f(x) = x|x|$ is differentiable at $x = 0$.
4. Let $f(x) = x^n$ for some $n \in \mathbb{N}$. Using binomial expansion

$$(a+h)^n = \sum_{i=0}^{n} \binom{n}{i} a^{n-i} h^i$$

show that $f'(a) = na^{n-1}$.

5.$\star$ [1] Let f and g be differentiable functions from $\mathbb{R} \to \mathbb{R}$. Show that the composite $f \circ g$ is a differentiable function.

[1] The starred problems will not be asked in quiz