Reading Quiz #3

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Read Sections 3.1-3.5 (pages 127-175) and do the following.

1. Determine whether $f'(0)$ exists, where $f(x) = \begin{cases} x^2 \sin \frac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$.

2. (a) Sketch the graph of the function $f(x) = x|x|$.

   (b) For what values of x is f differentiable?

   (c) Find a formula for f'.

3. Consider the function f defined as

$$f(x) = \frac{x(1-x)(2-x)(3-x)(4-x)(5-x)(6-x)(7-x)}{(1+x)(2+x)(3+x)(4+x)(5+x)(6+x)(7+x)}.$$

   Find the derivative of f at $x = 0$,

   (a) by the definition of $f'(0)$;

   (b) by any of the differentiation rules.