

1. True or False?

If $f : \mathbb{R} \rightarrow \mathbb{R}$ is differentiable and $f'(a) = 0$, then f has a local extremum at a .

2. True or False?

If $f, g : \mathbb{R} \rightarrow \mathbb{R}$ are functions such that $f + g$ is differentiable at a point $a \in \mathbb{R}$, then f and g are also differentiable at a .

3. True or False?

The function $f : \mathbb{R} \rightarrow \mathbb{R}$ given by

$$f(x) = \begin{cases} \sin(1/x) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$

is differentiable.

4. True or False?

The function $f : \mathbb{R} \rightarrow \mathbb{R}$ given by

$$f(x) = \begin{cases} x \sin(1/x) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$

is differentiable.

5. True or False?

The function $f : \mathbb{R} \rightarrow \mathbb{R}$ given by

$$f(x) = \begin{cases} x^2 \sin(1/x) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$

is differentiable.