Velocity Problem

A particle is moving on a straight line. Suppose the velocity of the particle at a particular time \( t_0 \) is positive.

**Part 1:**
Claim: There is some interval of time around \( t_0 \) during which:
- All of the particle’s positions after time \( t_0 \) are to the right of its position at \( t_0 \).
- All of the particle’s positions before time \( t_0 \) are to the left of its position at \( t_0 \).

Is the claim true? Why or why not?

**Part 2:**
(1) Formulate an analogy of the above claim in the case in which the velocity of the particle at time \( t_0 \) is negative.
(2) Formulate an analogy of the above claim for any (differentiable) function \( f : \mathbb{R} \rightarrow \mathbb{R} \).