Honors Calculus Quiz 2 9/5/3

Name
Signature

Show your work.

Question 1
Given that \( \lim_{t \to 0} f(t) = \lim_{t \to 0} g(t) = 25 \), compute the following limits:

- \( \lim_{t \to 0} \frac{f^2(t)}{\sqrt{16g(t)+9f(t)}} \)
- \( \lim_{t \to 0} \frac{\sqrt{f(t)-\sqrt{g(t)}}}{g^2(t)-f^2(t)} \).

Question 2
Find each limit, or if a limit does not exist, say why not.

- \( \lim_{t \to 1} \frac{t^3-1}{t^2-1} \).
- \( \lim_{t \to 2} \frac{1}{(t-2)} - \left( \frac{1}{t^2} - \frac{1}{3} \right) \).
- \( \lim_{t \to 25} \frac{5-\sqrt{t}}{t^2-625} \).

Question 3
A particle moves along the \( x \)-axis, such that its position \( x \) in meters from the origin at time \( t \) seconds is given by the formula (valid for \( t > -1 \)):

\[ x = \frac{1}{t+1} - t. \]

- Compute the average velocity \( V \) of the particle taken over the time interval from 0 to \( t \) seconds, where \( t \neq 0 \) and \( t > -1 \).
- Plot the average velocity \( V \) for the time period \( [-\frac{1}{2}, 1] - \{0\} \).
- What are the values of \( V \), when \( t = 1 \), \( t = 0.1 \) and \( t = 0.01 \)?
- Find, by taking a suitable limit, the instantaneous velocity of the particle at time \( t = 0 \) and hence determine the equation of the tangent line to the graph of the position against time, at time \( t = 0 \).