1. For a function $f(x)$, what is the definition of the derivative $f'(x)$?

2. Use the definition of derivative to find the derivative of $f(x) = \frac{1}{1-x}$.

3. Let

$$f(x) = \begin{cases} 
\cos(x), & \text{if } x < 0 \\
1 - x^2, & \text{if } x \geq 0 
\end{cases}$$

Is $f(x)$ continuous at $x = 0$? Is it differentiable?

4. Let

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

Is $f(x)$ continuous at $x = 0$? Is it differentiable?

5. Finish this sentence: To prove that $\lim_{x \to 1} f(x) = 3$, we have to show that for every $\varepsilon > 0$ there is some $\delta > 0$ such that if $|x - 1| < \delta$, then ...